Carbon Pricing to contribute to Greenhouse Gas mitigation efforts of Bangladesh: Design features and Rationale

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Acronyms

BAU	:	Business as Usual
BPDB	:	Bangladesh Power Development Board
CDM	:	Clean Development Mechanism
CETS	:	China Emissions Trading Scheme
CO_2	:	Carbon dioxide
CO_2e	:	Carbon dioxide equivalent
DC	:	Designated Consumer
DRC	:	Development and Reform Commission
EDF	:	Environmental Defense Fund
EFD	:	Environment for Development
ETS	:	Emissions Trading Scheme
EU ETS	:	European Union Emissions Trading Scheme
EY	:	Ernst & Young
FY	:	Fiscal year
GDP	:	Gross Domestic Product
GHG	:	Greenhouse Gas
ICAP	:	International Carbon Action Partnership
IEA	:	International Energy Agency
IETA	:	International Emissions Trading Association
KETS		Korea Emissions Trading Scheme
KWH	:	Kilowatt-Hour
LEED	:	Leadership in Energy and Environmental Design
MOEF	:	Ministry of Environment and Forests, renamed as Ministry of Environment,
	:	Forest and Climate Change (MOEFC)
MRV	:	Measuring, Reporting & Verification
MW	:	Megawatt
MWH	:	Megawatt-Hour
NCEEF	:	National Clean Energy and Environment Fund
NDC	:	Nationally Determined Contributions
NDRC	:	National Development and Reform Commission
PAT	:	Perform, Achieve and Trade
PDB	:	Power Development Board
PMR	:	Partnership for Market Readiness
PSMP	:	Power Systems Master Plan

REDD+	:	Reducing Emissions from Deforestation and Forest Degradation
SREDA	:	Sustainable and Renewable Energy Development Authority
TMS	:	Target Management System
UNFCCC	:	United Nations Framework Convention on Climate Change
USGBC	:	United States Green Building Council

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Executive Summary

Background and Objectives

In tandem with sustained economic growth in the last three decades, led by industrial sector, Bangladesh's overall energy consumption and associated greenhouse gas (GHG) emission have increased. As the country aspires to become a high-income country by 2041, the trends of energy consumption and GHG emission are expected to continue in the foreseeable future. The recently prepared third national communication for the United Nations Framework Convention on Climate Change (UNFCCC) highlights that per capita GHG emission in 2005 was 0.85 ton of Carbon dioxide equivalent (CO_2e) against previously declared 0.23 ton of CO_2e for the same year in the second national communication submitted to the UNFCCC in 2012. The third national communication further reveals that per capita GHG emission was 0.98 ton of CO_2e in 2012. On the other hand, the power systems masterplan 2016 (PSMP-16) projects a substantial increase in the use of coal, i.e., by up to 35% from present paltry 1.3%, in power generation in 2041 and the Nationally Determined Contributions (NDC) also has provision for using coal in power generation. While according to NDC, Bangladesh has vowed to reduce GHG emissions in power, transport and industry unconditionally by 5% and conditionally by 15% in 2030 compared to business-as-usual (BAU) scenario, the trend of growth in GHG emission might significantly exceed the BAU GHG emission in 2030.

The NDC of Bangladesh includes, among others, energy efficiency and renewable energy, to fulfill the target of mitigation. However, renewable energy and energy efficiency are yet to yield significant results. Therefore, the country should have policies in place to guarantee that pledges on emission reduction are materialized. On the other hand, increasing use of coal is planned in PSMP-16 based on the assumption that coal would remain the cheapest fuel in the future whereas renewable energy is evidently cheaper than coal in the international market. Moreover, carbon pricing scheme, such as, emissions trading scheme (ETS) or carbon tax, globally plays important role in mitigating GHG emissions while promoting sustainable energy, but no such scheme is included in NDC of Bangladesh. In view of these, the study has shed light on the role and rationality of carbon pricing in Bangladesh in relation to GHG mitigation and promotion of sustainable energy. Specifically, the study has looked into the main motivation for introducing a carbon pricing scheme in Bangladesh and which instrument would be appropriate for Bangladesh. In addition, the study has argued whether it would be more suitable to start with a gradual phase and finally, the study has recommended the

implementation framework of a carbon pricing instrument, i.e., the steps that would lead up to the implementation of the instrument.

Methodology

The study has drawn experience from operational carbon pricing instruments of different countries across the world. While the research is undertaken on wide ranges of carbon pricing instruments, being implemented globally, specific attention has been given to the recently implemented instruments and the instruments of comparable countries. Furthermore, the European Union ETS (EU ETS) has been considered, particularly as the research project is being undertaken in Germany.

For each instrument of different jurisdictions, a detailed assessment is carried out to understand the rationality, design features of the scheme in question and what lessons can be drawn from that. Extensive desk research has been done in that regard. In order to determine the motivation behind introducing a carbon pricing scheme in Bangladesh, the energy and climate policies along with energy consumption and emission patterns of the country have been analyzed and stakeholders have been consulted. To receive expert opinions and qualitative responses, a questionnaire has been developed with five key areas of focus, viz. i. What could be the main motivation for introducing carbon pricing instrument in Bangladesh, ii. What would be the rationale for business entities or establishments to accept carbon pricing, iii. Which type of instrument would be most suitable for implementation in Bangladesh and why, iv. What would be the most important steps/preconditions for implementation of a carbon pricing instrument in Bangladesh & v. Do you think starting with a gradual phase is a good idea & why, based on which criteria could sectors/sub-sectors be chosen for inclusion in a trial period/gradual phase/pilot and what would you hope to gain from a trial period/gradual phase/pilot? The questionnaire is prefaced by a short background on energy and climate policies of Bangladesh along with relevant information.

Stakeholders from Bangladesh, Germany and other countries have been engaged to get specific responses against the questionnaire. The stakeholders have been strategically chosen from experts of private sectors, think tanks, NGOs, ministries, academia, development agencies and financial institutions. A total of 20 interviews has been conducted either in-person or over phone/internet. Finally, guided by the responses of the questions with the review outputs of operational carbon pricing schemes, an implementation framework of a carbon pricing scheme for Bangladesh is drafted.

Study Outputs

i. Motivation behind introducing carbon pricing in Bangladesh

GHG mitigation is seen as the prime motivation to introduce a carbon pricing scheme in the country as increasing trend of emission would further exacerbate, resulting from enhanced economic growth. It is expected that putting a price on carbon would encourage investment in low carbon technology and thereby reduce emissions. The respondents have felt that revenue to be generated from carbon pricing would help increase investment in sustainable energy and environmental activities. As air quality is poor and showing a deteriorating trend in the country, interviewees have opined that co-benefits, such as air quality improvement, would be another important rationale behind adopting a carbon pricing instrument. Overall, the respondents have a feeling that carbon pricing would ultimately end the presence of energy price distortion, attributed to the presence of subsidy. They also opine that the fossil fuels are likely to be costlier as different countries undertake mitigation actions and as such, apart from introducing a carbon pricing scheme, the government need to review its plan to increase share of coal in power generation.

ii. Rationale for business entities to accept carbon pricing

Only responses from Bangladeshi experts are sought on this particular question. Majority of them believe that developing green business should be the main motivation for business entities to accept carbon pricing. Citing the examples of green industries established in Bangladesh and certified by Leadership in Energy and Environmental Design (LEED) in recent years, a considerable portion of the respondents have opined that carbon pricing would encourage industries to be LEED certified and eventually enhance the image of local industries, branding them internationally.

iii. Choice of carbon pricing instrument

A carbon tax is seen as the most appropriate instrument for Bangladesh by majority of the respondents. In determining the appropriateness of such a scheme, ease of implementation of a carbon tax system compared to a cap and trade system is considered the most important reason, which is further being strengthened by the fact that a corporate tax system does exist in Bangladesh. Therefore, the existing set-up could be utilized for a carbon tax with little fine-tuning. In the present context, the country has a very low tax to GDP ratio and as such, spending on mitigation projects by the government seems unlikely. A fiscal reform with introduction of a carbon tax would be a source of significant revenue, which could be utilized for mitigation and environmental projects. The question comes whether a carbon tax scheme

would jeopardize national development priority but the essence of carbon tax in that context is that it could complement other policies, viz. renewable energy and energy efficiency, through revenue redistribution mechanism. Air quality improvement project is another avenue where carbon revenue could be used. Through carbon tax, Bangladesh could reduce price distortions present in energy prices and eventually remove them in phases. As such, carbon pricing should be flanked with complementary climate and related policies. Additionally, most respondents consider a mandatory scheme as the most suitable way forward for Bangladesh to achieve desired impacts, i.e., reducing emissions and achieving NDC targets.

iv. Why a gradual phase is necessary and criteria for selection of sectors/sub-sectors to include in the gradual phase

A gradual phase is viewed by the all interviewees as a platform to not only gather experience and address untoward challenges but also fine-tune the scheme before implementing it at a larger scale. Therefore, the respondents have recommended being cautious while introducing such a tool and move gradually from a small scale of few sub-sectors. This would build public confidence to move ahead to expand the scheme at a later stage. In parallel, a gradual phase, according to some of the respondents, would provide the message that the government would not tolerate pollution in the long run. For selection of subsector/sector for inclusion in the gradual phase, the emission profile/energy intensity of a subsector/sector is seen as the main criteria. This would ensure that energy-intensive and highly polluting sub-sectors/sectors are first brought under carbon pricing. A sub-sector, where it is easy to implement the instrument, could also be considered for the initial phase.

v. Important steps/preconditions

From the responses of the stakeholders, seven important preconditions for setting up a carbon pricing scheme in Bangladesh have been selected, viz. i. Political commitment; ii. Stakeholder consultation; iii. Aligning with energy policy; iii. Sectoral studies & distributional impacts; v. Awareness raising; vi. Creation of an enabling environment, including administrative & enforcement & vii. Revenue redistribution mechanism. Almost all respondents are in the view that strong political commitment is the most important precondition to be fulfilled to implement a carbon tax, followed by political dialogue and stakeholder consultation to create public acceptability. Clear policy goals, i.e., the intended objectives of a carbon tax, shall be communicated to the stakeholders and at the same time, these goals shall be aligned with energy policies. It is necessary to assess the distributional impacts of carbon tax before introducing such a tool. Respondents believe that how revenue collected from carbon tax

would be redistributed to support sustainable energy, GHG mitigation and air quality improvement projects shall be notified so that people are convinced that carbon pricing would deliver multiple benefits, i.e., help achieve NDC targets, develop sustainable energy and bring positive social impacts. Institutional capacity development activities to create an enabling environment to manage and implement carbon tax along with nation-wide awareness-raising campaigns shall be carried out. The respondents have stressed on the enforcement mechanism, which, if not properly taken care of, would not deliver the results.

Recommendation on Implementation framework of proposed carbon pricing scheme for Bangladesh

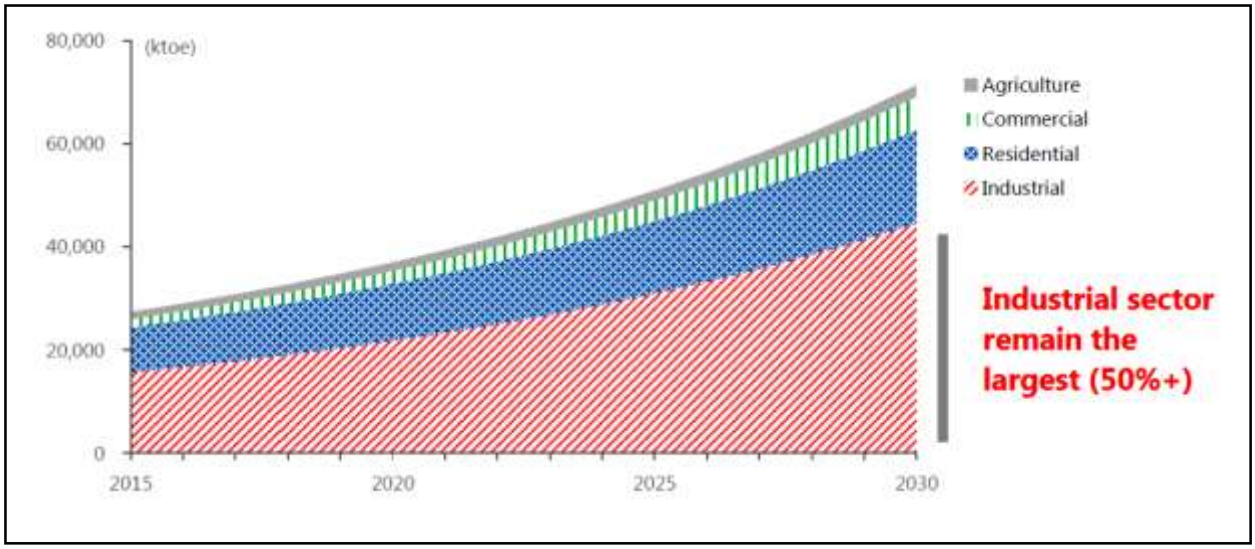
Based on the perceptions of interviewees and literature review, the study proposes an eight-step implementation framework for the carbon pricing tool in Bangladesh. The overlapping stakeholder engagement/consultation, which is shown on the right side and linked with several steps, shall be inclusive and started as soon as possible once the decision on carbon tax is finalized. The steps are illustrated in the below figure:

I. Background of the Study

I.I Energy Policy Context of Bangladesh

Bangladesh is historically one of the least energy consuming nations in the world. However, sustained economic growth during the last three decades[1] has resulted in increased energy consumption. As the country aspires to become a developed nation[2] by 2041, energy consumption would continue to show the increasing trend in the foreseeable future (Power Division, 2016). The government's forecast reveals that energy consumption under business as usual (BAU) scenario, taking into account of projected economic growth while upholding the basic necessities of the common people that include ensuring access to electricity, is expected to triple over the period from 2015 to 2030. The industrial sector would remain the largest energy-consuming sector in the country with energy demand in the sector is anticipated to grow at a higher rate compared to other sectors (SREDA & Power Division, 2015).

FIG I: Forecast for energy demand of Bangladesh up to 2030



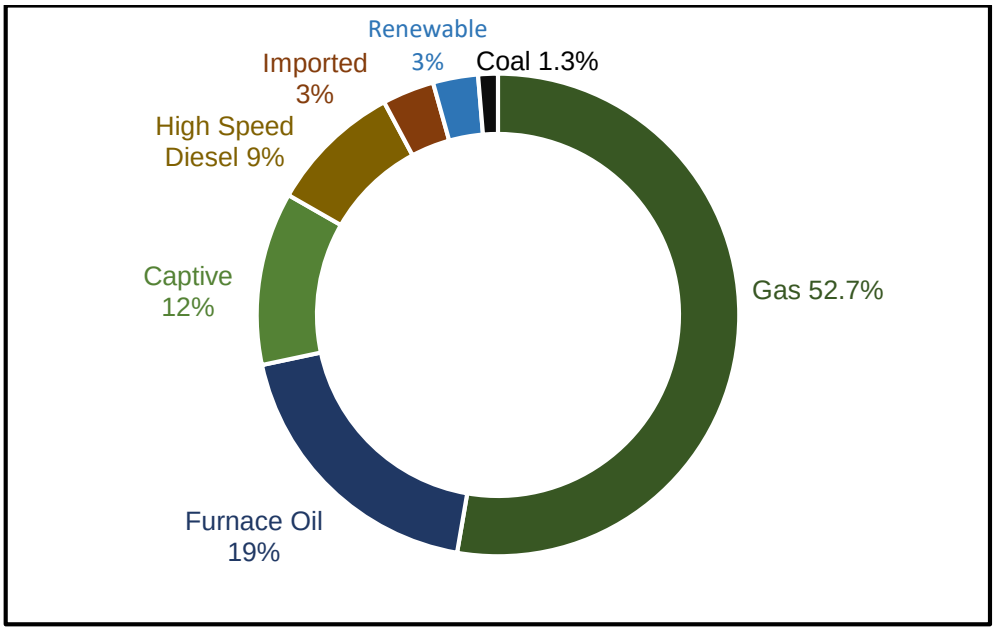
When only electricity is taken into account, the demand under base case[3] is estimated to be over 61,000 Megawatt (MW) in 2041 under BAU scenario, i.e., without energy efficiency and conservation measures. Share of coal in power generation, according to power systems master plan 2016 (PSMP-16), may increase up to 35% in 2041, against its present share of 1.3%, assuming coal as the cheapest fuel (Power Division, 2016).

[1] Average 6.7% per annum (enhancing opportunities for clean and resilient growth in Bangladesh)
[2] https://www.dhakatribune.com/bangladesh/2017/04/26/goal-becoming-developed-nation-2041
[3] GDP growth assumed to increase up to 8% in 2020 and decrease to 6.9% in 2025 and then reduce to 4.4% in 2041.

The energy efficiency policy stipulates 15% and 20% targets of energy efficiency, i.e., the reduction of 15% and 20% of primary energy consumption per unit of gross domestic product (GDP), by 2021 & 2030 respectively. These targets are subject to the energy savings achieved on the demand side, i.e., industries, residential buildings and commercial buildings, through energy efficiency and conservation measures. Notably, there are proven energy efficiency opportunities in these sectors when compared to international benchmarks on energy consumption in the same sectors (SREDA & Power Division, 2015). If energy efficiency target of 20% is taken into account, the demand for power in 2041 would reduce to roughly around 50,000 MW (Power Division, 2016). On the other hand, the renewable energy policy has set a target of 10% power generation from renewable energy sources by 2020. The present contribution to the energy mix in electricity generation is only 572.63 MW, representing only 3.02% share (SREDA, 2019). Of the total renewable energy based power, hydroelectric power plants of 230 MW were installed during 1962-88 (Alam & Kader, 2018).

In summary, during the last decade, the achievement in renewable energy and energy efficiency is quite inadequate and the pressure to increase power generating capacity to propel the growing economy has rather triggered a shift from natural gas dependency to increased reliance on liquid fuels. Lack of initiatives to harness unexplored gas from available reserve in the deep sea is also liable for such a trend. Overall, the lagging performance on renewable energy and energy efficiency fronts can be best described as the absence of incentives and presence of energy subsidies at the same time (Alam & Kader, 2018).

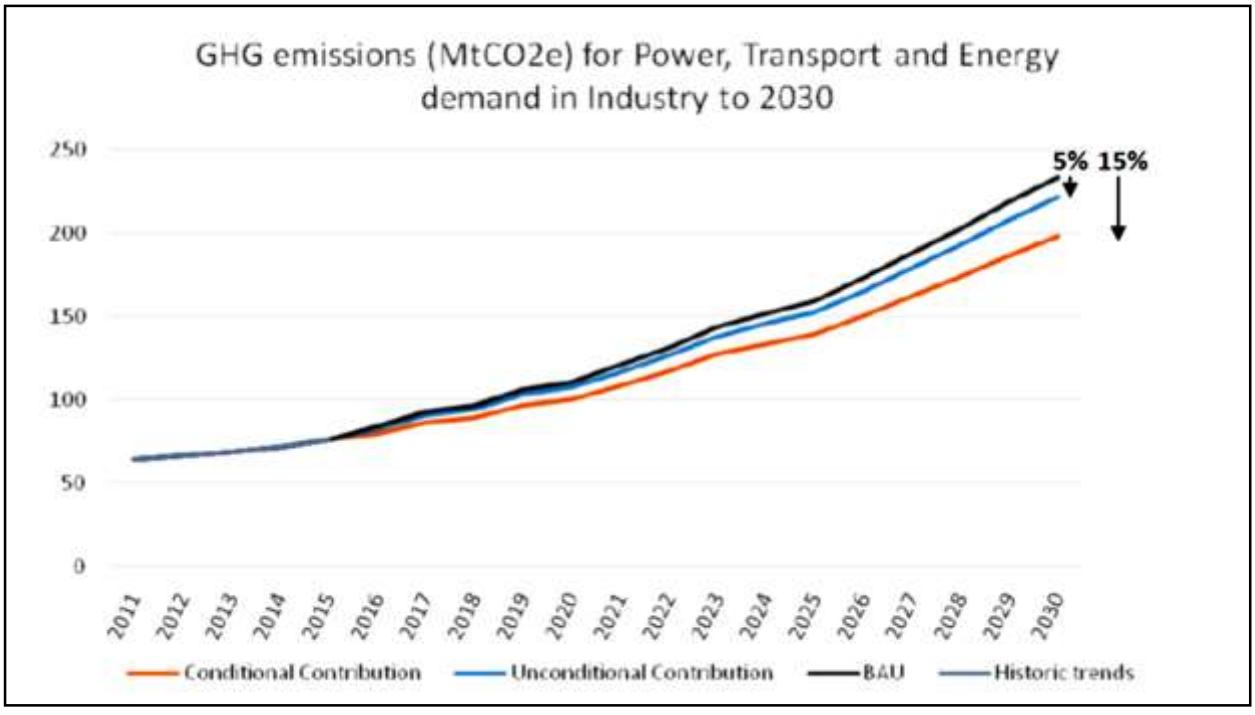
FIG II: Energy mix in power generation of Bangladesh (including captive and solar home systems)



I.II Climate Policy Context of Bangladesh

In 2009, Bangladesh has prepared its first climate change strategy and action plan, prioritizing adaptation to climate change and disaster risk reduction, which serves as a testament to the country's high vulnerability to climate change. The "mitigation and low carbon development" is one of the six pillars, based on which the climate change strategy and action plan of Bangladesh is being built (MOEF, 2009). While repeatedly being reported as one of the most vulnerable countries in the world, the country has committed to reduce greenhouse gas (GHG) emissions in its (Intended) Nationally Determined Contributions (NDC) at its own responsibility and with international support. Specifically, the government has fixed a target of unconditionally reducing altogether 5% GHG emissions in power, transport and industry in 2030 compared to BAU scenario. The conditional target is reducing altogether 15% GHG emissions in the same sectors. The pledged reduction is planned to achieve mainly through renewable energy and energy efficiency. The estimated cost for renewable energy is in the order of 5 billion US$. On adaptation context, planned areas of interventions include, among others, food and water security, flood control, community-based adaptation, capacity building etc. (MOEF, 2015).

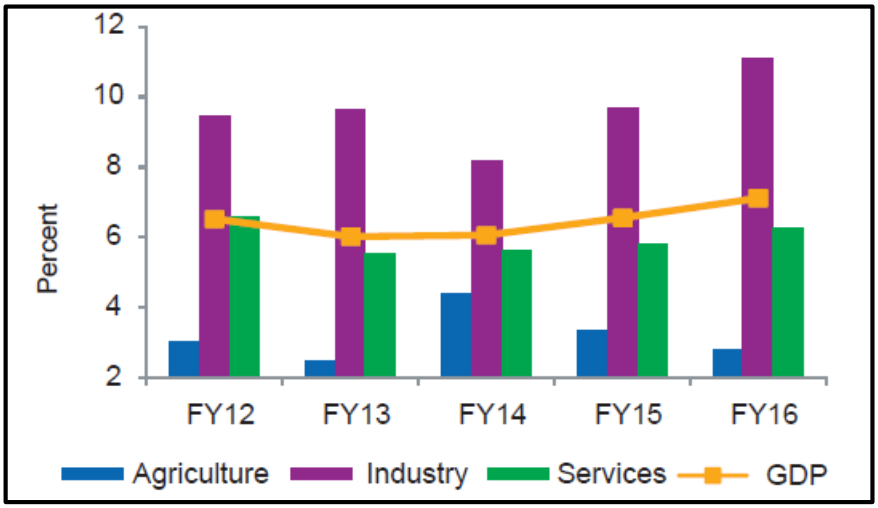
FIG III: Bangladesh's conditional and unconditional mitigation targets under NDC



I.III Increasing trend of GHG Emission and Deteriorating Air Quality

Bangladesh has been a low GHG emitting country due to low level of energy consumption. However, energy consumption has been increasing and industrial activities are picking up. Contribution of the industry sector to GDP of Bangladesh has been steadily increasing, i.e., from 29% to 31.5% during the fiscal year 2013 to 2016 (FY13 to FY16). In FY16, the industry sector grew at 11.1% (Bangladesh Bank, 2017). In FY17, contribution of the sector to GDP has further increased and stood at 33.71% (TextileToday, 2018). The other two sectors - agriculture and service - are also growing but at a lower rate. Energy consumption of the country over the last several years has been significantly influenced by the growth of these three sectors.

FIG IV: Sectoral contributions to Bangladesh's GDP



Although the present level of per capita GHG emission is not officially declared, per capita GHG emission in 2012, based on the third national communication to be submitted to the United Nations Framework Convention on Climate Change (UNFCCC), stood at 0.98 ton of CO_2 equivalent (CO_2e) against 0.85 ton of CO_2e in 2005 (Dhaka Tribune, 2019). However, according to the second national communication previously reported to the UNFCCC in 2012, per capita GHG emission was 0.23 ton of CO_2e in 2005. The latest report, i.e., third national communication, highlights that overall GHG emission was already more than 3 times in 2005 compared to the previous estimate. Therefore, it is likely that sectoral emissions of the base year 2011 reported in NDC were already exceeded at the time of preparation of NDC in 2015. On the other hand, overall energy consumption after 2012 has seen a major rise coupled with the increasing use of liquid fuel in power generation. While the use of coal in power generation is included in developing BAU emission in NDC, the BAU emission projected up to 2030 in

NDC might exceed due to substantial change in emission in third national communication from pervious communication along with the increasing trend of energy consumption.

In environmental context, Bangladesh has performed poorly, sitting at 179th place among 180 countries analyzed under the 2018 Environmental Performance Index compared to its position of 169 in 2014 (Hsu, et al., 2014). In terms of air quality, the country is again placed at 179th due to emissions from household solid fuels along with PM2.5 and PM10 exposures (Yale University & Columbia University, 2019; Hsu, et al., 2014). Modeling shows that PM2.5 concentration increases during the operational season of brick kilns in Dhaka city (Guttikunda, 2009). Brick kiln sector is also one of the largest sources of GHG emission in Bangladesh. Of the total coal consumption in industrial sub-sectors, the brick kiln consumes 62.5% (SREDA & Power Division, 2015). Overall GHG emission of the sub-sector in 2011 stood at 9.8 million tons of CO_2 per annum (World Bank, 2011).

I.IV Motivation for Research on Carbon Pricing

As of April 2018, 20% to 25% of global carbon emissions are covered by explicit carbon pricing[4] compared to 13% in 2016. Implicit carbon pricing[5] is also being implemented by different countries and if it is considered, coverage of overall emissions by carbon pricing would further increase. Carbon revenues generated from different carbon pricing instruments globally represent an important avenue for financing both environmental and economic activities (Métivier, Bultheel, & Postic, 2018). While the NDC of Bangladesh includes different mitigation measures to achieve the targets, carbon pricing, as a mitigation instrument, is not included. However, the energy efficiency master plan has suggested that the government might tax fossil fuels in the future to create a revenue stream to partly support energy efficiency and conservation activities (SREDA & Power Division, 2015). In addition, there has been a discussion on green tax in Bangladesh during 2015 to provide disincentives for major polluting industries so as to ensure that they take measures to reduce pollution. But it hasn't seen much progress (The Daily Star, 2014). For the last decade, the government has been trying to regulate the polluting brick kiln sector, one of the major polluters in Bangladesh, through technology mandate under command and control approach, i.e., a prescription for efficient technologies that consume less coal. The technology adoption rate is very low and in many cases, the conversion to new technology is more on paper rather than reality (The Daily Star, 2016). Two projects, including 16 new technology brick kilns, have been implemented under the Clean Development Mechanism (CDM). Overall, 11 projects have thus far been

[4] Includes ETS and tax per unit of CO_2
[5] Taxes on fuel per liter, electricity per MWH etc.

implemented with CDM. While the experience shows that the instrument has the potential to reduce emissions, the slump in price of emission units and less capacity of the project developers have resulted in very little success of CDM in Bangladesh.

It is also mentionable that despite upward adjustment of energy and electricity tariffs, energy is still subsidized in Bangladesh. During FY 2016-17, the subsidy in power generation stood over BDT 4,000 crore, which is approximately US$ 500 million (BPDB, 2017). If overall energy consumption, including that for transportation, cooking and fuel supply to industries, is considered, total expenditure on subsidy would be more. It is evident that energy subsidies disproportionately benefit the people of high-income group instead of people of low-income group (Timilsina, Pragal, Tsigas, & Sahin, 2018). Notably, the government is in the process of phasing out energy subsidies. On the other hand, the pan to increase share of coal in power system is based on the assumption that coal would continue to be the cheapest fuel in the coming years is not tenable as renewable energy is already cheaper in the international market compared to coal[6]. In view of the above, the research is designed to shed light on the role of carbon pricing instrument in GHG mitigation and promotion of sustainable energy in Bangladesh perspective.

I.V Research Questions

The overall goal of the research is to explore the role of carbon pricing and its rationale with possible design and implementation framework for Bangladesh. In that regard, a questionnaire is being developed in five key areas, as shown below:

I. **Motivation for Carbon Pricing**: What could be the main motivation for introducing a carbon pricing instrument in Bangladesh?

II. **Rationale for Business Entities**: What would be the rationale for business entities or establishments to accept carbon pricing?

III. **Type of Pricing Instruments**: Which type of instrument would be most suitable for implementation in Bangladesh in your opinion and why?

IV. **Preconditions for Implementation**: What would be the most important steps/preconditions for implementation of a carbon pricing instrument in Bangladesh?

[6] https://www.climateforesight.eu/inequalities/when-renewables-are-cheaper-coping-with-the-coal-cost-crossover/

V. **Trial Period/Gradual Phase/Pilot**: Do you think starting with a trial period/gradual phase/pilot would be a good idea at the beginning and why? Based on which criteria could sectors be chosen for inclusion in a trial period/gradual phase/pilot? What would you hope to gain from the trial period/gradual phase/pilot?

I.VI Methodology

The study has reviewed energy and climate change policies and relevant reports of Bangladesh and analyzed the present energy scenario and status of GHG emission to identify policy gaps and the necessity of introducing a carbon pricing instrument in Bangladesh. The study has further drawn experience from operational carbon pricing instruments of selected countries. For each instrument of different jurisdictions, a detailed assessment is carried out to understand the rationality, design features of the scheme in question and what lessons can be drawn for Bangladesh. Finally, questionnaire-based interviews with stakeholders from Bangladesh, Germany and other countries have been conducted to accomplish the goals of the study. A mixed questionnaire format, including open-ended and closed-ended questions, has been designed for the interviewees, strategically chosen from experts of private sectors, think tanks, NGOs, ministries, academia, development agencies and financial institutions. As the objectives of the interviews have been to get views of stakeholders on carbon pricing in Bangladesh context, issues of familiarity with national context have appeared. While the respondents from Bangladesh are well aware of national circumstances, the internationals are not necessarily so. To deal with that, the questionnaire has been designed with a brief on relevant policies, energy mix and regulatory aspects of Bangladesh.

I.VII Structure of the Report

This report contains six Sections. The section I has presented, among other things, the energy and climate policies of Bangladesh along with the objectives and methodology of the study. In Section II, a brief overview of carbon pricing tools and the role of carbon pricing in GHG mitigation is discussed. Section III includes a review of selected operational carbon pricing tools of different countries with main attention given to parameters in relation to the goal of the study. Section IV focuses on the results of interviews conducted with national and international experts. Results of interviews are presented in separate graphs for each question followed by an analysis of the responses. Finally, Section IV ends with the author's evaluation of the interview outcomes with regard to the objectives of the study. Section V deals with the brief proposal for the development of a carbon pricing scheme for Bangladesh, consisting of design features and implementation framework. The report concludes with Section VI.

II. Carbon Pricing

II. I Carbon pricing basics

“The polluter pays principle” forms the basis of carbon pricing in environmental policy to reflect the cost of damage inflicted by business activities in the cost of doing business. The underlying assumption of the principle is that putting a price on carbon provides the business entities an incentive to find less polluting ways to carry out their businesses and switch to low-carbon pathways. Carbon pricing instruments are implemented by imposing a charge on per ton of greenhouse gases released into the atmosphere and measured in CO_2e. The great advantage of carbon pricing instruments is the flexibility that the instruments provide to the businesses in deciding when and where to invest in low carbon and alternative technology, creating efficiency in reducing emissions in the most cost-effective way (Carbon Market Watch, 2017).

II.II Types of carbon pricing instruments

Carbon pricing usually takes the form of either a carbon tax or a requirement to purchase a limited number of tradeable permits to pollute, commonly referred to as a cap and trade or emissions trading scheme (ETS).

A carbon tax, for instance, is a constant price for a given ton of CO_2e. The fee does not vary in relation to the quantity of emissions but rather it provides a constant price signal to reduce pollution.

A cap and trade system, on the other hand, restricts the total quantity of pollution permits under the “cap” and allows the price to fluctuate vis-à-vis demand and supply of permits. The demand for the permits depends on the amount of emissions released by entities and the options they have to reduce their emissions. While the initial supply is sold to emitters usually through an auction providing an initial price, a secondary market price emerges through buying and selling of permits between emitters and other intermediaries (Carbon Market Watch, 2017).

The same modality of a cap and trade system is being applied in India for the industries with very high energy consumption by creating a cap on energy consumption and allowing price to emerge through trading of energy savings between industries, known as Perform, Achieve and Trade (PAT) scheme.

Carbon pricing also takes two other forms, i.e., explicit and implicit carbon pricing. Carbon tax and Cap and trade instruments put a price explicitly on GHG emissions. Implicit carbon prices, on the other hand, include excise taxes per liter of fuel or taxes on electricity per Kilowatt-Hour (KWH) imposed on different sectors of the economy (Métivier, Bultheel, & Postic, 2018).

II.III Reasons to use carbon pricing in climate policy

As of April 1, 2018, 46 countries and 26 provinces or cities have adopted carbon pricing policies, accounting for around 60% of global GDP. The adoption of carbon pricing policies is also increasing (Métivier, Bultheel, & Postic, 2018). There are seven good reasons to use carbon pricing in climate policy as appended below (Baranzini, et al., 2016):

i. Under carbon pricing, firms and consumers do not only take into account their private costs and benefits but also account for the social costs due to carbon emissions generated over the product life cycle. As a consequence, the entire economy can become less carbon-intensive attributed to the decisions of consumers and producers to adjust to prices corrected for the climate externality.

ii. Carbon pricing can address the heterogeneity of greenhouse gas emissions arising from different technologies, production sizes etc., and help to minimize the cost of pollution control. In theory, taking perfect information and rationality into account, all entities should choose emissions abatement up to the point where related marginal abatement cost equals the carbon price and this would result in identical marginal abatement costs across all polluters for a given carbon price. It indicates that a particular mitigation goal can be achieved globally in the least cost way. In reality, due to the presence of information asymmetry, the actual cost will not be the lowest. Nevertheless, empirical research suggests that reliance on non-price policy instruments can lead to substantially higher abatement costs compared to pricing instruments.

iii. Carbon pricing stimulates research and development, innovation and adoption of new technologies that result in less emission. Empirical evidence shows a positive correlation between higher energy prices and the development of cleaner technologies through innovation.

iv. Carbon pricing helps check the rebound effect. While technological advancements and enhanced energy efficiency tend to lead to a direct reduction in energy consumption, the service for people, for instance, traveling by car becomes cheaper. However, a general consensus is that if behavioral changes are not made with the adoption of energy efficient technologies, people consume more energy than before (people may drive more). It is argued that chances for such a rebound effect to take place would be limited if carbon pricing is in place as it would discourage more use of an efficient car with carbon pricing in effect.

v. Carbon pricing allows for flexibility and autonomy of choice, as emitters can freely change their behavior to reduce their costs.

vi. Many people would like to contribute at a personal cost to more responsible use of resources but the perception that individual action alone has an insignificant impact often discourages people to undertake these voluntary actions. Moreover, many consumers are sensitive to personally salient concerns, notably financial considerations, when making purchasing decisions. Carbon pricing regulation is capable of doing this as it naturally intervenes in the core element, i.e., pricing, of markets.

vii. Emission leakages can be addressed through an international carbon price covering all countries and sectors.

III. Review of Selected Carbon Pricing Instruments

III.I Selection of countries and carbon pricing instruments

Both operational carbon tax and cap and trade of different countries are reviewed. In selection of instruments, factors such as, comparable countries and the pricing instruments that have been introduced in the last several years are taken into consideration. In that regard, India is the most comparable country to Bangladesh and therefore, the coal tax of India, referred here as carbon tax, and Perform, Achieve and Trade (PAT) scheme of India, comparable to cap and trade scheme, are chosen. Carbon tax implemented in Mexico and Colombia along with operational ETS of Korea and China are also reviewed. In addition to these, the European Union ETS (EU ETS) are analyzed.

III.I.A Carbon Tax in India

i. Rationale

India's national action plan on climate change embodies, among others, the promotion of solar energy, energy efficiency enhancement and green development. In an attempt to meet the cost of mitigation, the Indian government has created National Clean Energy and Environment Fund (NCEEF), based on the tax imposed on imported as well as domestically produced coal (Shakti Sustainable Energy Foundation & EY, 2018). This tax has been utilized to promote renewable energy in India and during 2010-11 to 2016-17 and a total fund worth INR 12,430 crore (US$ 1.8 billion) has been allocated for renewable energy (Cleantechnica, 2017). Approximately INR of another 5,000 crore was expected to be utilized for renewable energy by 2018 (Shakti Sustainable Energy Foundation & EY, 2018).

ii. Institutional and other requirements

The NCEEF has been created through the Finance Bill 2010 aiming to utilize revenue collected from tax on coal towards the promotion of clean energy and related projects. The coal tax is levied by the Central Board of Excise and Customs, India. Designated officials of the same authority monitor revenue collection (Shakti Sustainable Energy Foundation & EY, 2018).

iii. Features

The initial coal tax (Cess) was set at modest INR 50 (approximately 0.7 US$ at current value) per ton of coal and gradually increased to up to INR 400 (approximately US$ 5.64) per ton of coal. Tax is applicable at upstream on the gross quantity of coal being produced from mines and the same being imported. The revenue is being used for clean energy (Shakti Sustainable Energy Foundation & EY, 2018). Producers and suppliers are required to determine the amount of cess (tax), pay to the Ministry of Finance and keep record of the same. If tax is not paid on time, coal producers face penalty (PMR, 2017b).

iv. Lessons learned

Carbon tax, i.e., coal cess, implemented in India has helped in the promotion of renewable energy. The tax has been increased gradually to avoid sudden burden on the downstream. As the tax has been applied at upstream, the monitoring and other administrative measures have been simple. While the main objective of the tax was to meet the cost of mitigation and support clean energy and environmental projects, there was issue of fund diversion to other projects.

III.I.B Carbon Tax in Mexico

i. Rationale

Mexico implemented a carbon tax on fossil fuel production, as fiscal reform initiatives. The initiative also provided the Mexican entities to surrender Certified Emissions Reductions (CERs), under CDM, as compliance measure to carbon tax especially due to the slump of CERs in the international market (EDF & IETA, 2018). The carbon tax in Mexico has been implemented mainly with dual purpose, i.e., to strengthen Mexico's climate change policy portfolio and raise revenues for the government (McCoy, 2015). Other objective of the tax is to create awareness on CO_2 emissions (Pegels, 2016).

ii. Institutional and other requirements

The General Law on Climate Change Law (GLCC) provides the pathway for Mexico to make transition towards a low carbon economy. The law includes carbon tax as a probable mitigation instrument and has established the basis for the creation of institutions, legal frameworks and financing for the said transition (LSE, 2012). Although the climate change law includes carbon tax instrument for mitigation (Muñoz-Piña, n.d.), the President of Mexico in 2013 proposed to implement a carbon tax policy. Later on, GLCC has been amended in 2014 to incorporate

carbon tax (LSE, 2012; EDSF & IETA, 2018). Existing institute, i.e., the Revenue Collection agency (SAT) is responsible for collection and auditing of carbon tax like other excise taxes (Muñoz-Piña, n.d.).

iii. Features

Mexico has started with a low price of US$ 3 per ton of CO_2e and the average price ranges from US$ 3.5 to 3.7 per ton of CO_2e (EDSF & IETA, 2018; Muñoz-Piña, n.d.; Pegels, 2016). Coal and petroleum, excluding natural gas, are mainly included in the tax scheme. The carbon tax of Mexico is applied at upstream based on production or import of fossil fuels at a fixed rate. There is inflationary adjustment of tax rate on annual basis. Entities liable for paying carbon tax can meet up to 20% of obligation by transferring CERs of CDM projects. Rules for the offset from CERs are being defined by the Secretariat of Finance (EDSF & IETA, 2018; Muñoz-Piña, n.d.; García, 2017).

iv. Lessons learned

Altogether the administrative process is very simple but the monitoring system is lagging. The carbon tax is estimated to reduce annual emission reduction of around 1.8 million tons of CO_2e. However, there has been no announcement on revenue redistribution towards climate protection, which questions the main objective of the carbon tax (García, 2017; Muñoz-Piña, n.d.); Other pertinent questions are whether shall price of carbon be increased and other fuels be covered by carbon pricing (García, 2017).

III.I.C Carbon Tax in Colombia

i. Rationale

During the last several years, Colombia has seen a trend in increasing use of fossil fuels in power generation, attributable to the possible impacts of climate change on water sources that until now help generate a major portion of the country's electricity. On the other hand, the country developed the first phase of Low Carbon Development Strategy 2020-2030 in 2012. The NDC of Colombia requires unconditional mitigation of GHG emission of 20% by 2030 compared to BAU (Carbon Trust, EDF, & IETA, 2018). A study has identified that a carbon tax of US$ 50 per ton of CO_2 can reduce 33% energy-related emissions by 2045. The study has further concluded that a carbon tax would not significantly affect macroeconomic indicators (Delgado, Matajira, Cadena, & Alvarez, 2015). Recommendations of the study have positively influenced the adoption of a carbon tax in Colombia and worked as inputs for the carbon tax enacted in 2017 (EfD, 2018).

ii. Institutional and other requirements

Carbon tax has been introduced in Colombia as part of tax reform package in 2016, with effect from January 2017, through the law 1819 a. The National Directorate of Taxes of Colombia (DIAN) is responsible for collection and administration of carbon revenue and the Ministry of Environment and Sustainable Development looks after the reporting and verification of emissions (Carbon Trust, EDF, & IETA, 2018).

iii. Features

Tax has been set at a modest US$ 5 per ton of CO_2 but with a provision of gradual increase of one-point rate, with inflation, per annum, until the tax rate reaches US$ 10 per ton of CO_2 (Carbon Trust, EDF, & IETA, 2018). The tax is applicable to sales and imports of all fossil fuels except for coal. However, the condition is that the tax is obligatory for all producers and importers of liquid fuels and that of natural gas only when the same is being used for industrial purposes. Entities under carbon tax obligation can request for 100% tax exemption via Clean Development Mechanism (CDM) and/ or Reducing Emissions from Deforestation and Forest Degradation (REDD+) projects subject to verification by a third party (Carbon Trust, EDF, & IETA, 2018). Revenues collected through tax are being used on environmental and rural development projects in post-conflict areas (Romero, 2018).

iv. Lessons learned

Like India and Mexico, the tax has been kept low at the beginning and the administrative process is simple. But the exemption of coal from tax may create a perverse incentive to increase coal consumption as natural gas for industrial purposes is being taxed (Carbon Trust, EDF, & IETA, 2018).

III.I.D Korea ETS

i. Rationale

The Framework Act on ‘Low Carbon Green Growth’, declared by the President, has led the establishment of a market mechanism in order to meet the national greenhouse gas emission reduction targets (Chung, Salatiello, & Youn, 2012). The prospects of developing green businesses and increasing job opportunities have also acted as the motivation behind introducing the Korean ETS (KETS) (EDF & IEA, 2013). Additionally, a study identified that KETS would reduce 44% to 68% cost compared to other measures in achieving mitigation target of 2020 (Suk & Liu, 2014).

ii. Institutional and other requirements

After declaration on "Low Carbon Green Growth" by the Government of Korea, a Framework Act was adopted in 2010 targeting 30% GHG emissions by 2020 compared to the BAU scenario. Article 46[7] of the Act has provided the primary basis for implementing KETS. In the process of establishing a mandatory ETS, the Korean Government developed a Greenhouse Gas and Energy Target Management System (TMS) in 2010 (Chung, Salatiello, & Youn, 2012). Later on, the framework for a KETS was adopted on May 2, 2012, supported by lawmakers (ICAP, 2014). The Ministry of Environment is the mandated agency to look after KETS (ICAP, 2018a).

iii. Features

The KETS covers approximately 599 of the country's largest emitters under 23 sub-sectors, accounting for around 68% of national GHG emissions. A company emitting more than 125,000 ton of CO_2/year or a facility releasing 25,000 ton of CO_2/year is included in KETS. During the phase I of KETS, run from 2015 to 2017, allowances were freely allocated to the companies and facilities but about 5% of total allowances were retained in a reserve for market stabilization measures. In addition, unallocated allowances and withdrawn allowances were transferred to the reserve. During Phase II, i.e., 2018-2020, 97% of the allowances would be allocated free while the remainder would be auctioned to generate revenue. All entities, under KETS, are required to monitor annual GHG emissions, verify their annual emissions by a third party verifier and submit report on annual emissions to the Ministry of Environment (MOE) within three months from the end of a compliance year. The report is being certified by the Certification Committee of the Ministry. If the report fails to capture emissions of any entity properly, the report is disqualified, resulting in a penalty for per unit of CO_2. Borrowing[8] of allowances only during ongoing phase and banking[9] without any restriction are allowed in KETS as flexibility measures under certain conditions. Entities can offset up to 5% of their obligations from international CDM projects. There is also provision for market stabilization to ensure that allowance price doesn't exceed certain thresholds and/or fall below certain limits (ICAP, 2018a).

[7] The Government may operate a system for trading emissions of greenhouse gases by utilizing market functions in order to accomplish its target of reduction of greenhouse gases.
[8] If future mitigation costs are anticipated to be lower, for example through new technology, entities may "borrow" allowances to surrender now, which are then deducted from their future budgets.
[9] It allows entities to hold surplus allowances from previous trading periods, when mitigation may have been easier, and to surrender them in future to comply, when it may be more expensive.

Before moving to the mandatory ETS, the Korean government adopted TMS, which has provided the opportunity to accumulate different data on emission and to know the reporting and monitoring of emission reductions. In addition, government agencies have also become experienced in dealing with covered entities to efficiently implement and manage a trading system (Chung, Salatiello, & Youn, 2012).

iv. Lessons learned

While a strong commitment from the government backed by support from the opposition party is one of the factors behind the implementation of KETS, TMS has provided the necessary leeway to implement the national trading scheme (Kim, 2013). Business entities during the first year of ETS complained about under estimation of BAU emissions and resulting low level of allowances provided to them (Kim, 2016). Therefore, BAU emissions need to be carefully calculated and quality of data is important in that regard. Moreover, from the outset, an allocation committee was appointed to intervene to stabilize the market with regard to fluctuating price (ICAP, 2017).

III.I.E China ETS

i. Rationale

China's rapid economic growth has come at the expense of increased consumption of resources, especially unclean and inefficient energy, with severe water and air pollution and land degradation. The impact of climate change on the domestic environment has also been the concern of china’s leaders (Economy, 2007). These concerns have forced the Chinese Leaders to think alternative options apart from the command and control instrument. Furthermore, in recent years, China has emerged as a climate leader internationally by ensuring that climate change stayed on top of both the international and China’s domestic agenda. Together with Europe and other major partners, China contributed significantly to paving the way for the rapid ratification of the Paris Agreement. Domestically, China’s highest political level is committed to move towards a low carbon pathway (ICAP, 2017). Moreover, as command and control instrument has had limited success over the years in attaining environmental goals, the Leaders have considered China ETS (CETS) as a mitigation tool (Zhang, 2015). On the other hand, China generally has been motivated by positive experience with the CDM, earning more than 50% carbon revenue generated by CDM projects

internationally[10]. This has prompted the Chinese Leaders to adopt pilot schemes. The experience of pilot projects is also positive - major polluters in Beijing, Shanghai and Shenzhen have been able to reduce GHG emissions ranging from 4.5% to 11.7% with reduced average cost of mitigation (Wang, 2016). All these have led to the implementation of national ETS in China.

ii. Institutional and other requirements

Following the 12th Five-year plan (2011-15) in 2010, that required the development of CETS, pilots were gradually developed in Beijing, Chongqing, Guangdong, Hubei, Shanghai, Shenzhen and Tianjin. In January 2015, the National Development and Reform Commission (NDRC) announced the launch of the national registry for voluntary emission trading. The NDRC guidelines helped structure the overall design of the pilot programs in setting of emission cap, allowance allocation methods, registry, trading, measuring, reporting & verification (MRV) etc. (IETA, 2015). The NDRC along with provincial Development and Reform Commissions (DRC) managed the pilot schemes. These pilots have allowed China to experiment with a variety of ETS designs in order to build a robust national carbon market by adopting a learning-by-doing approach (Zhang, 2015).

iii. Features

The CETS has just been in force in 2018 after years of piloting and the first phase includes only the power sector with combined heat and power system and captive power plants of other sectors. Approximately 1,700 entities with annual emissions of 26,000 tons of CO_2 or annual energy consumption of more than 10,000 ton of coal equivalent in any year over the period from 2013 to 2015 are included in CETS. Gradually other sectors would be included. While the first year has been considered as a period for the development of necessary infrastructure, the second year, i.e. 2019, is kept for simulation trading. The phase III, i.e., from 2020 onwards, is considered for market expansion. The reporting frequency by the entities is annual. There is also a provision for non-compliance but terms and conditions are yet to be disclosed. Banking is expected to be allowed across phases but borrowing is not. The use of voluntary GHG offsets may be allowed at some point in the third phase starting in 2020. The CETS is managed by NDRC with support from provincial/autonomous and regional/municipal DRCs (ICAP, 2018b).

[10] https://www.theclimategroup.org/sites/default/files/archive/files/Prospects-for-Carbon-Trading-in-China.pdf

iv. Lessons learned

Experience from pilots has greatly shaped the CETS, which covers only one sector and is expected to gradually cover other sectors. Experience in the pilot regions shows that entities have not recognized that emissions trading is not only a means of helping the covered entities to meet their emissions obligations but also to help them achieve the goals at low costs (Zhang, 2015). Shenzhen, Shanghai, Beijing, Guangdong, Tianjin and Fujian have been in almost full compliance in 2016 (PMR, 2017a).

III.I.F EU ETS

i. Rationale

While the European Union was an early proponent of quantitative restriction on greenhouse gas emissions, arguing in 1992 at the Rio summit for binding reduction targets, the Kyoto Protocol has played important role in the adoption of EU ETS in different ways. The Kyoto Protocol provided a quantitative target of 8% reduction from 1990 emissions for EU-15 and the flexible mechanisms including emissions trading were incorporated in Kyoto protocol to meet the target. On the other hand, there was burden-sharing agreement whereby each of the then 15 member states was given a legally binding target. All these provided a sense of urgency about making progress regarding emissions trading (Convery, 2009). In addition to this, there are other four factors that shaped the adoption of EU ETS: First, European governments came to recognize that additional measures would be needed if the EU15 were to meet their common Kyoto obligations and that these measures would need to be adopted at the European level. Second, an EU-wide carbon tax, a fiscal matter, unlike regulatory measures, requires the unanimous agreement of all member states but proposals to enact a carbon tax failed in the 1990s. Third, the evidence of US trading system for sulfur dioxide (SO_2) and the inclusion of trading in the Kyoto Protocol made trading a logical approach. Fourth, as the EU member countries lacked experience with trading systems and in the absence of necessary infrastructure to support ETS, a trial period to develop these prerequisites was taken into account (Ellerman, 2008). It was estimated that community-wide trading by energy producers and energy-intensive industries could reduce the costs of implementing the Kyoto commitments by nearly a fifth compared to separate Member State's initiatives without allowing cross-border emissions trading. The likely savings on account of emissions trading was in the order of Euro 1.7 billion a year. With a community ETS, a single price for allowances traded by companies would also ensure a level playing field for all compared to different prices under different national schemes (European Commission, 2000).

ii. Institutional and other requirements

Following discussions on a Green Paper by European Commission (European Commission, 2000) backed by a study of Capros and Manzos (2000)[11] on economic rationale of introducing EU ETS and based on revision on the initial draft presented in the EU parliament in 2002, EU ETS was legally accepted as a GHG mitigation tool in 2003. Finally, it came into effect with trading to commence on January 1, 2005 (Convery, 2009). The implementation power of EU ETS, including the allocation of allowances and monitoring, was conferred on the European Commission[12].

iii. Features

EU-ETS covers more than 11,000 power plants and manufacturing entities along with aircraft operators. Power plants and other combustion installations having more than 20 MW thermal rated input and industries of various thresholds are included in the scheme. However, all sectors and subsectors were not included at Phase I, i.e., 2005-2007, rather the scheme has been expanded over phases. While in Phase I (2005-2007), almost 100% allowances were freely allocated through grandfathering[13], some Member States used benchmarking[14] and some used auctioning[15]. The Phase III (2013-2020) includes significant increase in auctioning from 3% in previous Phase II to 57% while the remaining 43% is allocated freely. In the electricity sector, allowance is fully auctioned but in Phase IV, some member states may continue to use free allocation subject to GDP per capita of that country. For the manufacturing sector, the benchmark is being used. Sub-sectors having the risk of carbon leakage receive full free allocation while in other sub-sectors free allocation will be phased out gradually. All entities included in ETS are required to monitor emissions and report on annual emissions based on electronic templates prepared by the European Commission. In case of noncompliance, entities need to pay penalty. Unlimited banking is allowed since 2008. Borrowing is not allowed. The EU ETS Directive provides for measures in the event of excessive price fluctuations. In 2015, a decision to create a market stability reserve (MSR) was adopted. The MSR, which will start operating in January 2019, aims to neutralize the negative impacts of the existing allowance surplus and to improve the system's resilience to future shocks. EU-ETS is being administered by the European Commission and the relevant authorities of the 28 Member States, Iceland, Liechtenstein, and Norway (ICAP, 2018c). The

[11] http://ec.europa.eu/environment/enveco/climate_change/pdf/primes.pdf
[12] Directive 2003/87/EC OF The European Parliament and of the Council, 13 October 2003
[13] Process of allocating emission allowances to the entities according to their historical emissions in a base year or base period
[14] When allowances are allocated according to benchmark/performance indicators of entities
[15] Buying allowances from Regulator

first phase of the EU ETS ran from 2005 to 2007 and was seen as the pilot phase. This phase was used to test price formation in the carbon market and to establish the necessary infrastructure for monitoring, reporting and verification of emissions. The cap was largely based on estimates as there was no reliable emission data available. The primary purpose of phase I was to ensure the functionality of EU ETS effectively ahead of 2008 and to ensure that it would allow the EU Member States to meet their commitments under the Kyoto Protocol (European Union, 2015).

iv. Lessons learned

There was problem with baseline data at the beginning. The important benefit of the trial period was that at the end of the period more reliable data on actual emissions for included installations were available (Ellerman, 2008). Quality of data is important specially to set the cap properly and avoid over-allocation of allowances and therefore, the pilot phase of EU ETS has benefited EU ETS. To avoid an artificial price collapse at the end of a compliance period, it is necessary to allow for banking from one period to the next. The European system did not allow this in Phase I, and allowance prices fell to zero as that period came to a close. (Schmalensee & Stavins, 2015). However, banking is allowed from Phase II. The EU ETS shows that it is possible to move from a free allocation regime to an auction-based allocation gradually (Schmalensee & Stavins, 2015). Auctioning revenues can amplify the benefits of emissions trading. “What matters is the carbon price signal that covered installations see today and anticipate tomorrow. The European carbon market needs to deliver a price signal which is increasing over time in order to trigger investments” (ICAP, 2017). Price has a been long issue in EU ETS with surplus allowances. In that regard, MSR has been implemented in 2019.

III.I.G PAT Scheme India

i. Rationale

Reducing energy consumption of large energy consumers/designated consumers (DCs) and thereby contributing to climate change mitigation is the main reason to introduce the PAT scheme in India.

ii. Institutional and other requirements

Energy Conservation Act, 2001 empowers the Bureau of Energy Efficiency (BEE), India, to put in place the policies, rules and regulations to improve energy efficiency in energy-intensive industries. The origin of the PAT mechanism is the Energy Conservation Act, 2001, which has been amended over the years and supplemented by Rules and Regulations. One of such

Rules, namely PAT Rules 2012, provides the detailed procedures of PAT operation. Energy consumption thresholds for DCs, directives on mandatory energy auditing for DCs etc. have been incorporated. State designated agencies and enforcement officers are responsible for enforcement of the PAT scheme.

iii. Features

More than 400 industrial DCs of 8 sectors were included in the PAT scheme-phase I with the target of reducing specific energy consumption by 4.1% during 2012-15. During the next phase, i.e., 2016-19, the number of entities has been expanded to 621 with increased targets. In the PAT scheme, energy savings certificates are designed to be traded with 1 unit is equivalent to 1 ton of oil equivalent. The Central Electricity Regulatory Commission acts as the market regulator by defining the regulatory framework for trading. Accredited energy auditors verify energy savings against the set target. If a DC doesn't meet its target and fails to purchase sufficient savings certificates to compensate for its shortfall, the DC will be subject to a penalty. As a flexibility measure, banking from one cycle to the next compliance cycle is possible (IEA, 2019).

iv. Lessons learned

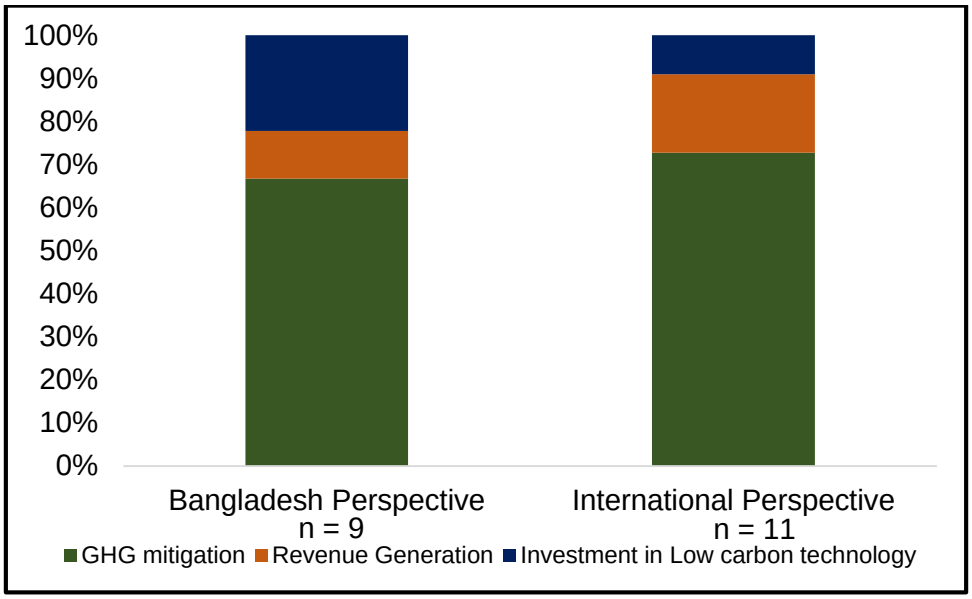
The target for energy efficiency in Phase-I has been low and all entities have achieved the target, resulting in no trading. Therefore, the target (CAP) is required to be set higher to allow trading and achieve higher level of energy savings.

IV. Outcomes of Interviews

IV.I Main Motivation behind introducing Carbon pricing in Bangladesh

Guided by the question, “what would be the main motivation for introducing carbon pricing instruments in Bangladesh”, respondents from Bangladesh, Germany and other countries have shared similar views, as shown in FIG V. GHG mitigation is seen, by 70% of both national and international respondents, as the main reason that should provide sufficient rationale to introduce a carbon pricing scheme in the country due to the increasing trend of GHG emissions during last several years, pushed by sustained economic growth. Both national and international respondents have felt that putting a price on carbon would encourage investment in low carbon technology, which would eventually reduce emissions. Other main motivation behind choosing carbon pricing instrument, as the respondents assumed, is to generate carbon revenue to utilize in implementing environmental projects.

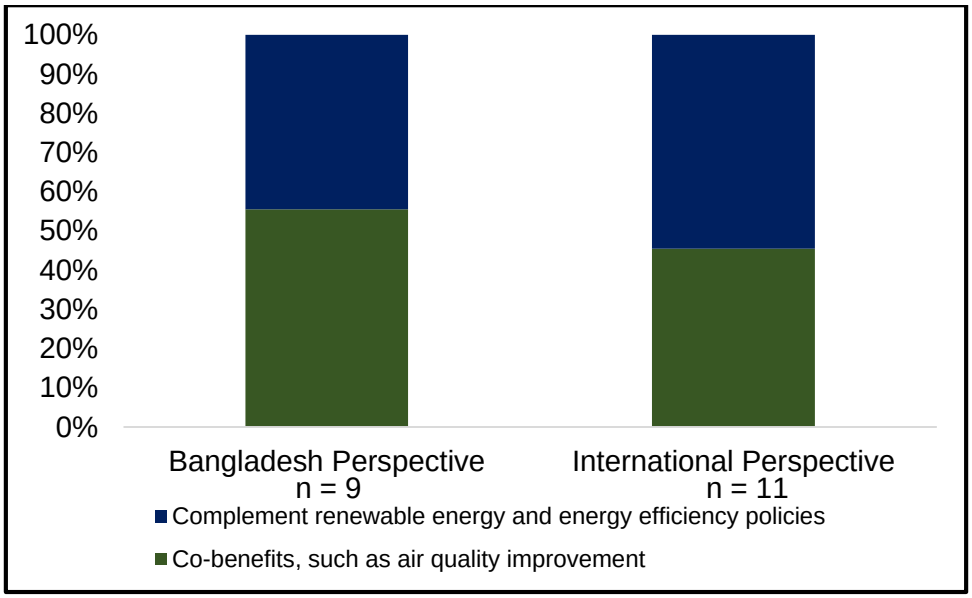
FIG V: Perceptions on main motivation for a carbon pricing scheme in Bangladesh



In choosing other motivations for carbon pricing, both national and international perspectives have again shown similarities. Stakeholders have preferred co-benefits and complementing renewable energy and energy efficiency policies as other motivating factors in their support of carbon pricing (see: FIG VI). As air quality is poor and exacerbating in the country, roughly half of the interviewees of both groups have opined co-benefits, such as, air quality improvement, is one of the two secondary reasons for introducing a carbon pricing tool in Bangladesh. Other stakeholders have acknowledged that a carbon pricing scheme would

complement both renewable energy and energy efficiency policies, removing the barriers that Bangladesh is facing in harnessing renewable energy and energy efficiency. Some of the respondents, in general, have a feeling that carbon price would eventually end the presence of energy price distortion, attributed to the presence of subsidy, and thereby create an enabling environment for clean energy promotion.

FIG VI: Other motivation for a carbon pricing scheme in Bangladesh



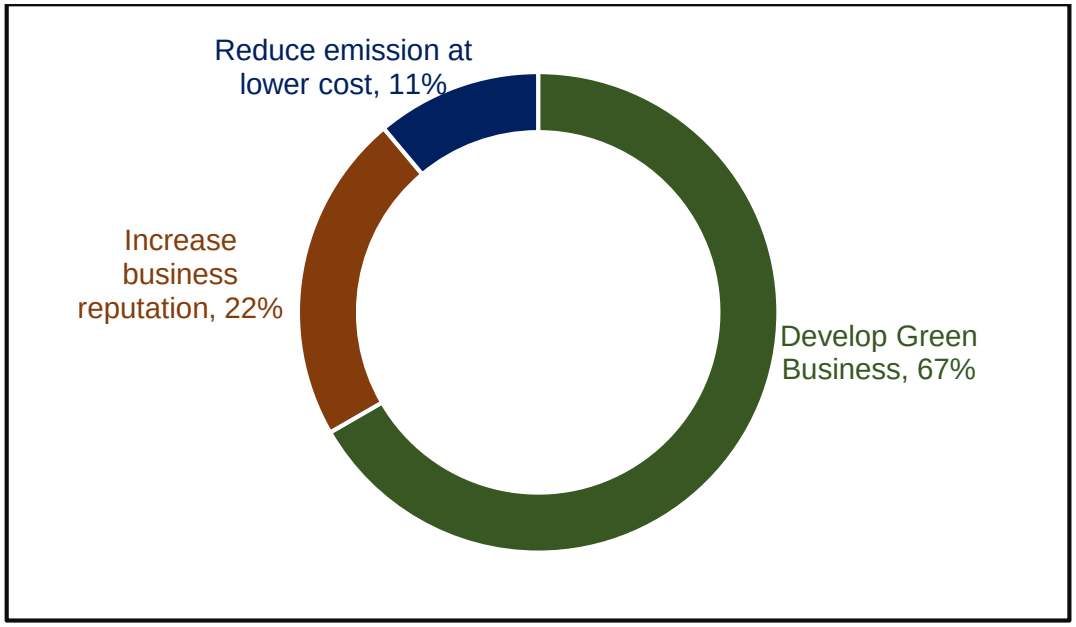
Almost every interviewee is in agreement that the fossil fuel is likely to be scarce/expensive as different countries take measures to address climate change and therefore, in addition to use a carbon pricing instrument, the government needs to reconsider the PSMP-16 particularly on the decision of increasing share of coal in the future.

IV.II Rationale for business entities to accept carbon pricing

Taking into account of national context, opinions from only national respondents are sought on the rationality behind accepting carbon pricing by business entities of Bangladesh. Two-thirds of the national stakeholders, as depicted in FIG VII, think that developing green business would be the main rationale for business entities to accept carbon pricing. Around a quarter of them feels that the reputation of business entities would be increased if they accept carbon pricing as a GHG mitigation tool. The reason behind such an opinion is that it would give a signal to the market or general people that businesses also have started to consider GHG mitigation in their business plans. The rest believes that reducing GHG emission at a lower cost would be the motive for business entities to welcome a carbon pricing tool as the

stakeholders argue that once the businesses agree on a carbon pricing tool, they would explore different GHG mitigation options, associated costs and cost minimization strategies to remain competitive in the market.

FIG VII: Why business entities should accept carbon pricing?



Citing the examples of green industries established in Bangladesh and certified by Leadership in Energy and Environmental Design (LEED) from United States Green Building Council (USGBC) in recent years, a considerable segment of the respondents has stated that carbon pricing scheme would help in increasing the number of such industries and eventually enhance the image of local industries, branding them internationally. Statistics of 2018 reveal that Bangladesh has more LEED-certified garments factories than any other country in the world. Industries of other sectors are also registered with USGBC and in the process of obtaining LEED certification (The Daily Star, 2018).

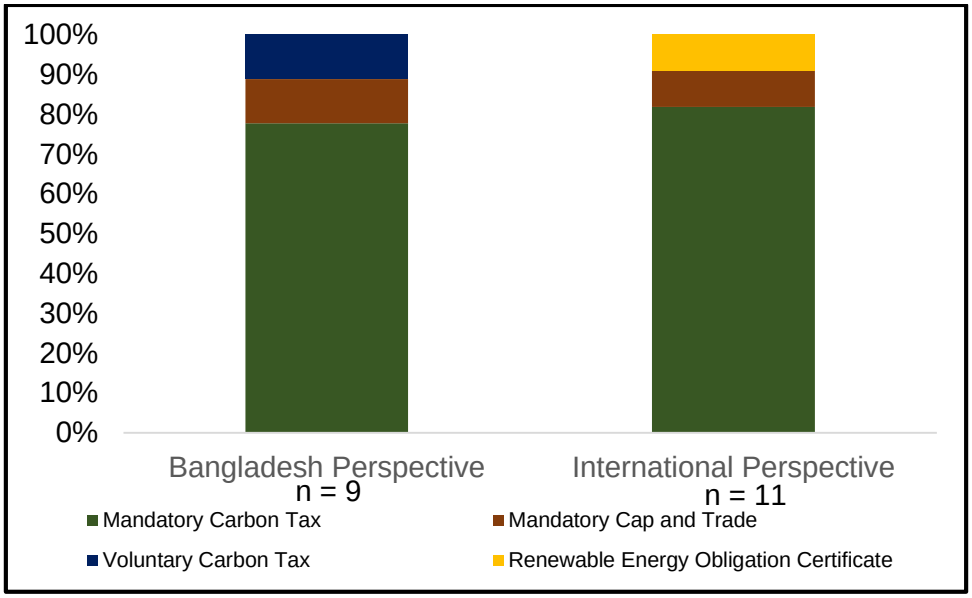
IV.III Choice of Carbon Pricing Instrument for Bangladesh

The question on “choice of carbon pricing instrument for Bangladesh” has sought views in three important and correlated scopes, viz. a) choice of main carbon pricing instrument for Bangladesh, b) reasons for selecting the type of scheme (mandatory or voluntary), & c) reasons to favor a specific pricing instrument over others.

IV.IIIa Choice of Primary Carbon Pricing Instrument

The question on choosing appropriate carbon pricing instrument garners high agreement on mandatory Carbon Tax as a primary instrument, from both national and international respondents. Around 80% of respondents from both groups share the view that carbon tax would be a simple instrument for Bangladesh to implement (see FIG VIII). Of the remaining respondents from Bangladesh, one believes a voluntary carbon tax at the beginning to be followed by a mandatory scheme would be ideal and the other thinks a mandatory Cap and Trade (ETS scheme) as a suitable tool for Bangladesh. On the other hand, one of the International respondents favors mandatory Cap and Trade while the other interviewee supports renewable energy obligation certificate as the main carbon pricing instrument.

FIG VIII: Perceptions on choosing primary carbon pricing instrument for Bangladesh

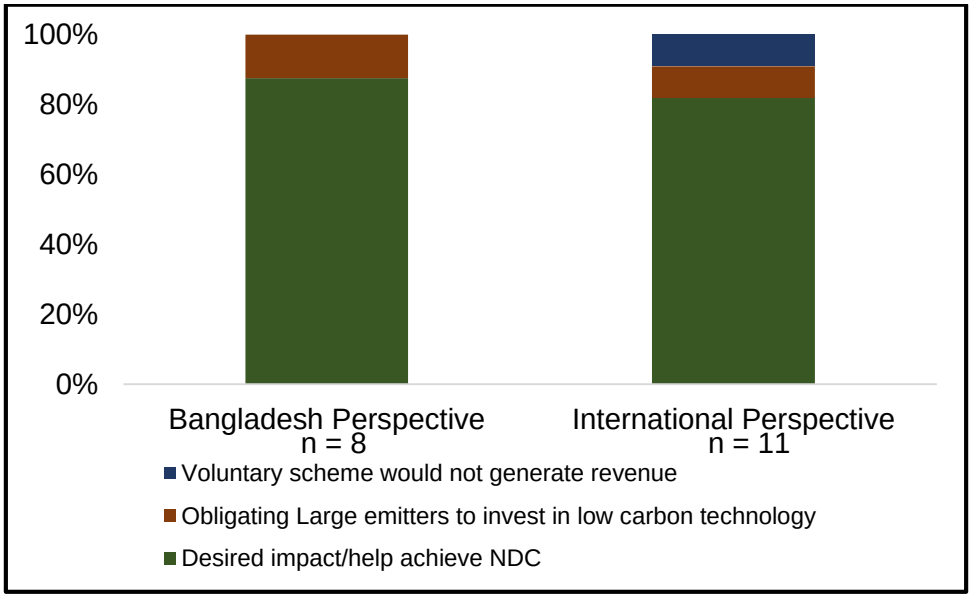


Regarding complementary instrument to support main carbon pricing instrument, majority of the respondents assume that it would be more realistic to work on developing the main carbon pricing instrument at this point instead of putting the focus on too many things. Once it is implemented and operational experiences are drawn, the need for complementary instruments may be considered. Majority of the stakeholders have the impression that either energy efficiency trading, like the PAT scheme in India, or renewable energy obligation certificate could be suitable for Bangladesh to support carbon tax scheme in the future. However, they have given more importance on the appropriate use of carbon revenue to support renewable energy and energy efficiency projects.

IV.IIIb Why mandatory scheme

Most of the respondents feel that a mandatory scheme would have a positive impact on Bangladesh's efforts to reduce GHG emissions. Other important aspect is the Government of Bangladesh's pledge to mitigate GHG emission under NDC and now the country needs to turn the pledges into effective policy. In that regard, more than 80% respondents from both Bangladesh and International categories see "mandatory scheme" as an ideal scheme, illustrated in FIG IX, to help Bangladesh achieve the mitigation target under NDC. The remaining participant from Bangladesh expresses that a mandatory scheme would compel large emitters to invest in low carbon technology. On the other hand, the remaining international respondents are found to be divided on their responses equally over "obligating large emitters to invest in low carbon technology" and "voluntary scheme would not generate revenue".

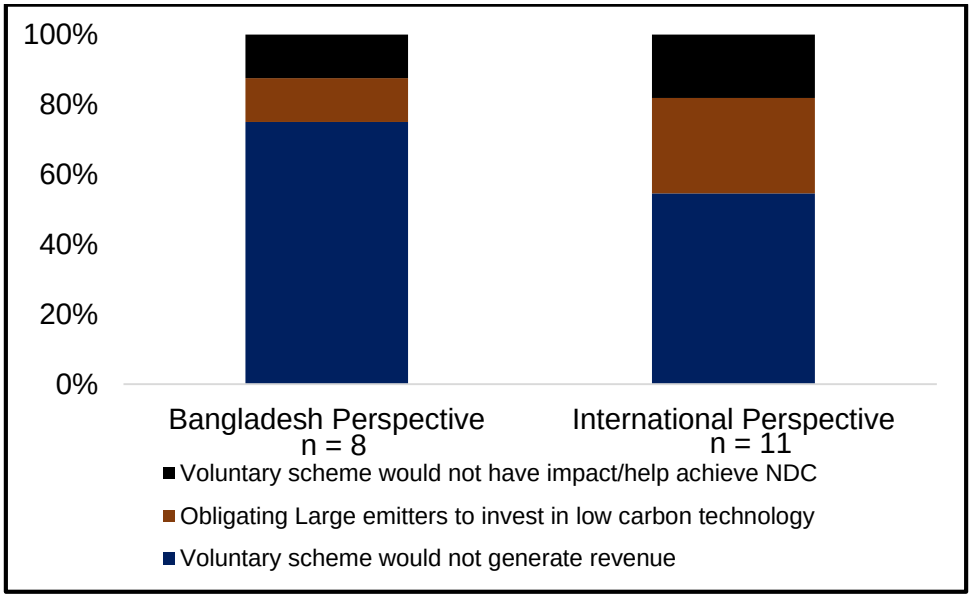
FIG IX: Main Rationality behind a mandatory carbon pricing scheme for Bangladesh



Regarding other justifications to adopt a mandatory scheme, the majority of the stakeholders, both national and international, have pricked "voluntary scheme would not generate revenue" (See: FIG X). Their preference to this particular argument stems from the fact that in a voluntary scheme, entities are not obliged to pay for emission and therefore, they may be ambivalent to invest in mitigation, leading to a status quo. Additionally, without revenue, the carbon pricing scheme would not help complement alternative energy policies and as such, there would not have any visible change with a voluntary scheme in place. The remaining stakeholders of both categories have divided opinions, such as, "obligating large entities to

invest in low carbon technology" and "voluntary scheme would not help achieve NDC" to support the introduction of a mandatory scheme.

FIG X: Other Rationality behind a mandatory carbon pricing scheme for Bangladesh



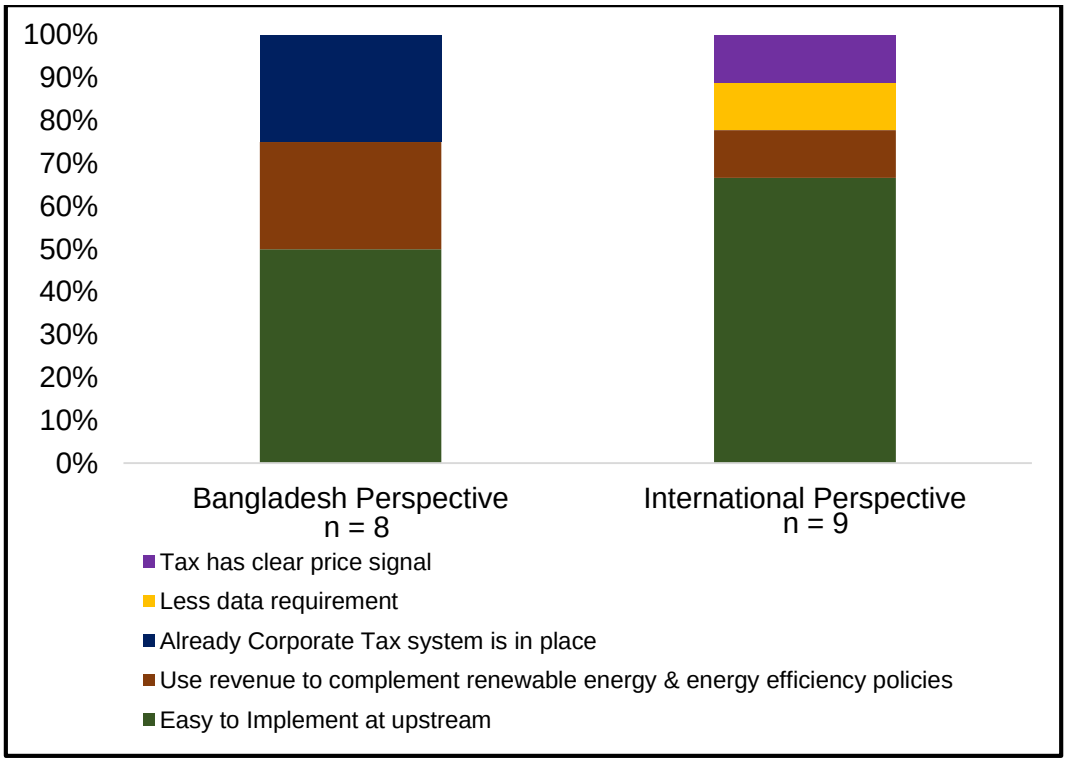
Overall, perception of the stakeholders is that while Bangladesh is one of the highly vulnerable countries due to climate change and adapting to climate change would be the priority, the present trend of increasing emissions would necessitate the country to implement a mandatory scheme instead of a voluntary scheme if it wants to achieve the goal of GHG mitigation. More importantly, it would also bring opportunities for the country especially in promotion of sustainable energy, where Bangladesh is currently facing challenges, through covering part of the investment risk with support from carbon revenue.

IV.IIIc Rationale behind choosing Carbon Tax

Half of the national stakeholder supports carbon tax due to its relative ease of implementation at the upstream with respect to other market-based instruments, as detailed in FIG XI. The remaining respondents are equally divided between "already corporate tax system is in place in Bangladesh" and "to utilize carbon revenue to complement renewable energy and energy efficiency policies" as the reasons to advocate carbon tax. On the other hand, two-thirds of international stakeholders argue that the ease of implementation should be the driving force to select carbon tax over other instruments. The remaining third of international participants' opinions to choose carbon tax are equally distributed on "tax has clear price signal", "use

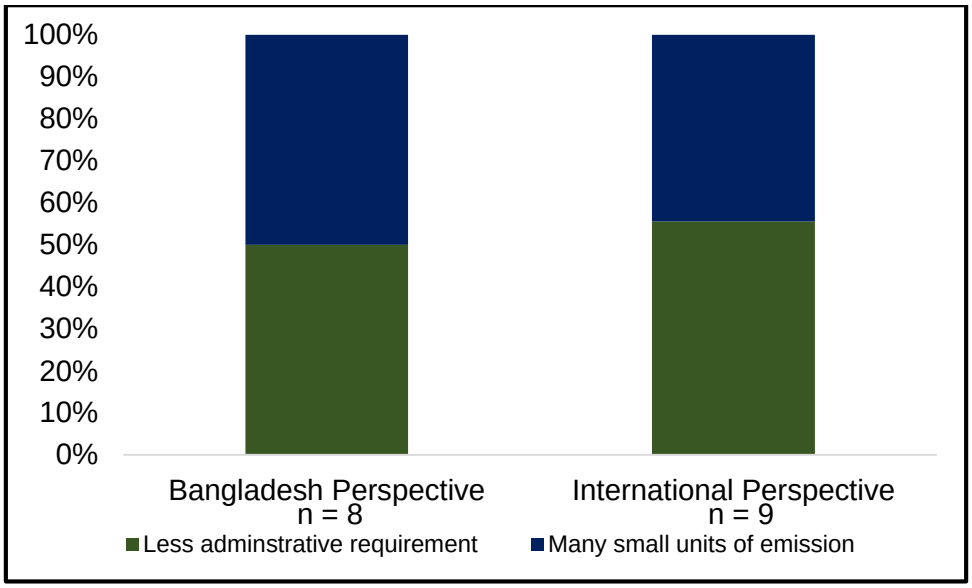
revenue to complement renewable energy and energy efficiency policies" and "less data requirement for carbon tax".

FIG XI: Main reasons to favor carbon tax as an appropriate tool for Bangladesh



With regard to other rationales behind choosing carbon tax, national and international respondents have shown similar preferences (See: FIG XII).

***FIG XII:** Other reasons to favor carbon tax as an appropriate tool for Bangladesh*



Roughly half of both groups believe that the presence of many small units of emissions would not suit a cap and trade system but a carbon tax would be appropriate instead. The remaining half of both groups have a feeling that the administrative requirement is less for carbon tax compared to a trading based system. Overall, the stakeholders have emphasized on the facts that tax could be implemented at upstream and as such, tax is not required to be imposed on every entity (important consideration due to many small emission units), reducing administrative burden. Tax gives a fixed price signal against the price volatility of emissions in ETS. Additionally, there is high transaction cost in ETS. One respondent from Bangladesh has pointed out that the tax to GDP ratio in Bangladesh[16] is very low and which is why; allocation of public fund for mitigation and environmental projects is unlikely in the present scenario. However, fiscal reform measure with a carbon tax could help the government to raise revenue for mitigation and environmental activities.

IV.IV Important preconditions for setting up carbon pricing scheme in Bangladesh

From the responses of the interviewees, seven most important preconditions for setting up a carbon pricing scheme in Bangladesh have been identified and highlighted below.

Preconditions for Carbon Pricing:

i. Political commitment;
ii. Aligning with energy policy;
iii. Sectoral studies & distributional impact;
iv. Stakeholder engagement;
v. Awareness raising;
vi. Creation of an enabling environment, including administrative & enforcement;
vii. Decision on revenue redistribution mechanism.

[16] Data of tax to GDP ratio of different countries are available at: https://data.worldbank.org/indicator/gc.tax.totl.gd.zs

While acknowledging that implementing carbon pricing instrument would be an important step for Bangladesh in reducing GHG emissions, almost all respondents are in the view that strong political willingness is the key to implement such an instrument. Political dialogue as well as stakeholder consultation at the early stage is indispensable to create public acceptability. Clear policy goals, i.e., the intended objectives of a carbon tax, shall be communicated to the stakeholders and at the same time, these goals shall be aligned with energy policies. Most of the respondents hold the opinion of conducting sectoral studies to assess the distributional impacts of carbon tax before introducing such a tool. Respondents also believe that how revenues collected from the tax would be redistributed to support sustainable energy, GHG mitigation and air quality improvement projects shall be clearly communicated to the stakeholders so that people are convinced that carbon pricing would not only help in achieving NDC targets but also bring positive social impacts. These must be accompanied by awareness raising activities across the sub-sectors to be covered by the carbon tax at the beginning. In addition, creation of an enabling environment, including appropriate institution, is necessary. As the corporate tax system is in effect in Bangladesh, there already exists an institution to manage a carbon tax scheme but stakeholders, especially due to inefficiency in present tax collection system, believe that institutional capacity development would be required. Unless the enforcement is strong enough, the policy instrument would not be effective.

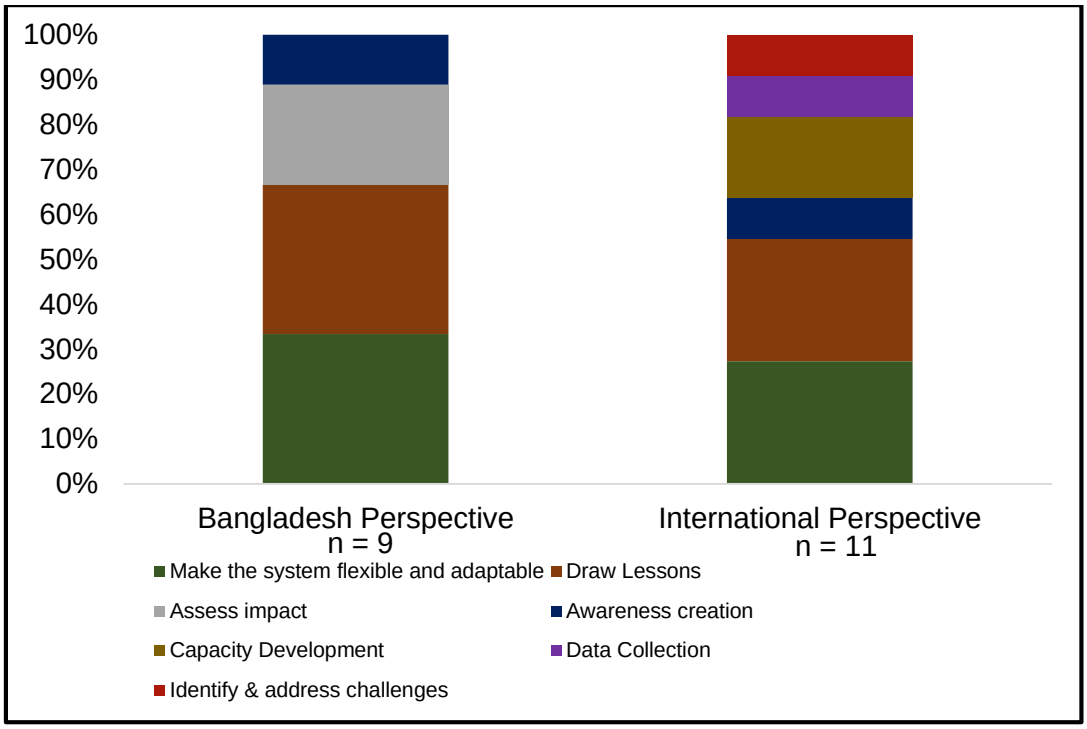
IV.V Starting with a trial period/gradual phase/pilot

The guiding question on trial period/gradual phase/pilot includes three major sections, i.e., a. do you think starting with a trial period/gradual phase/pilot would be a good idea at the beginning and why? b. based on which criteria could sectors be chosen for inclusion in a trial period/gradual phase/pilot? & c. what would you hope to gain from the trial period/gradual phase/pilot?

IV.Va Why a trial period/gradual phase/pilot would be a good idea?

The responses for the questions on “why a trial period/gradual phase/pilot would be a good idea and what would you hope to gain from a trial period/gradual phase/pilot” are compiled together. All respondents, both national and international, are in favor of a gradual phase, i.e., carbon pricing should be implemented at a small scale at the beginning and scaled up gradually.

FIG XIII: Why a gradual phase is necessary



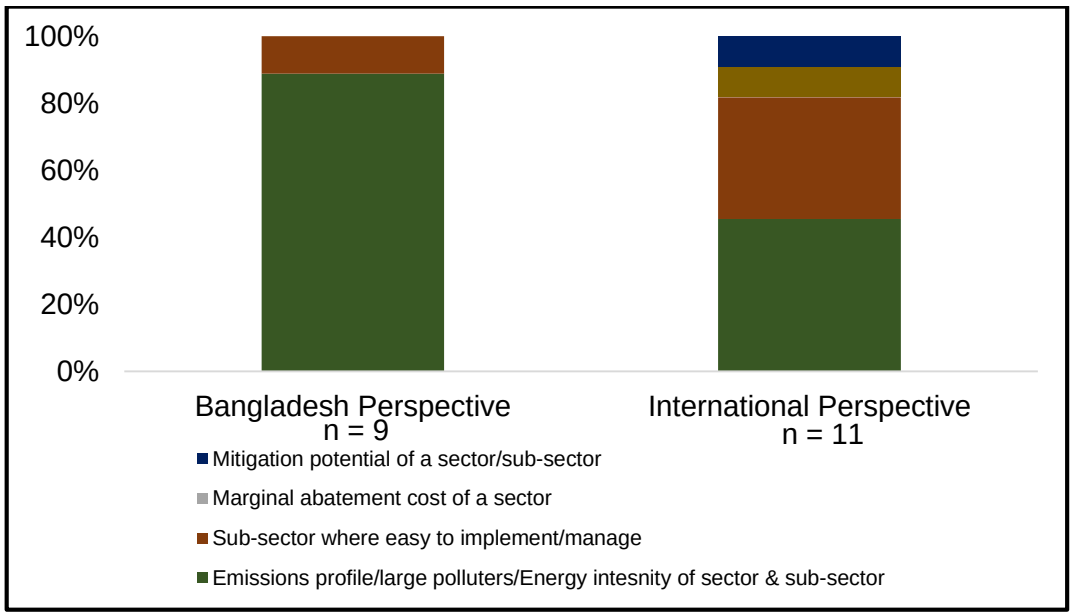
Arguments behind starting with a gradual phase are more dispersed, as evident from FIG XIII above, compared to the responses against other questions. One-third of Bangladeshi respondents believe that a gradual phase would give the entities flexibility and make them adaptable to the system while another third of them think that it would help in drawing lessons from the small initial phase. The remaining respondents believe either assessing impacts of the initial phase or creating awareness among the entities as the reason to follow a gradual phase for carbon tax in Bangladesh. On the other hand, while responses of the international participants are more varied than that of Bangladeshi participants, there is a similarity between the two groups. Less than a third of international respondents opine that gradual phase would ensure flexibility and adaptability and a similar percentage of them considers drawing lessons is the purpose to start with a small gradual phase. The rest of the international respondents provide different reasons for gradual phase, such as, developing capacity of institutes to be involved in managing and implementing carbon tax, awareness creation in the country, identification of challenges in a carbon tax system and data collection on emission.

The general perception of the stakeholders is that a gradual phase would make the system reliable and secure public confidence. Some of the Bangladeshi participants underline the importance of the gradual phase to give “message to the polluters that pollution would not be tolerated by the government in the long run”.

IV.Vb Criteria to select subsector/sector for the gradual phase

The question on main criteria to select subsector/sector for inclusion in the gradual phase of a carbon pricing scheme garners strong concurrence from Bangladeshi respondents in that around all but one suggests that emission profile/energy intensity of a subsector/sector to be the criterion to include it in the initial phase, presented in FIG XIV. This would ensure that large emitters are first brought under carbon pricing. The remaining participant is of the impression that the instrument should be first applied at the subsector, where it is easy. These two criteria have received maximum responses from international participants. Just less than half of them think emissions profile/energy intensity should be considered as selection criterion while just over one third believe that ease of implementation should be the criterion for choosing sector/sub-sector. Responses from other interviewees are split over mitigation potential of a sector/sub-sector and marginal abatement cost of a sector/sub-sector.

FIG XIV: Main criteria to include sub-sector/sector in the gradual phase



Apart from main criteria, participants have also chosen other criteria, which may be considered in selecting the sub-sector/sector for a gradual phase, highlighted below.

Other criteria to include sector/subsector to be covered by carbon pricing:

i. Political feasibility
ii. Life cycle assessment of emissions

Most of the respondents strongly believe that some of the sub-sectors may not be politically feasible to bring under carbon tax for reasons, such as, the sector's high contribution to GDP/export, the sector may need protection due to social circumstances etc. One example can be referred as the textile sector of Bangladesh, which contributes more than 10% to the country's GDP[17] and is under the preferential tax scheme of Bangladesh. One respondent has opined to consider life cycle assessment of emission to choose a subsector for a gradual phase.

IV.VI Summary of Interview Outcomes

The study has inquired into the rationale behind introducing a carbon pricing tool in Bangladesh and how it can contribute specifically to the NDC and also to energy policies of Bangladesh. The study has further looked into the suitable carbon pricing instrument for Bangladesh and the necessary steps to be considered to implement a carbon pricing scheme in Bangladesh. The consultations with relevant experts, as described above, have provided new insights on carbon pricing for Bangladesh, particularly in supporting other policies through carbon revenue to not only achieve the goal of mitigation but also enhance other development objectives of the country.

A carbon tax is seen as the most appropriate instrument for Bangladesh by the majority. Ease of implementation compared to a cap and trade system is considered the most important reason to select carbon tax. This reason is further being supplemented by the fact that a corporate tax system does exist in Bangladesh and therefore, existing set-up could be utilized for carbon tax with little fine-tuning, administrative and data requirements are less for carbon tax and many small units of emission do exist in the country. At the same time, the issue of low tax to GDP ratio of Bangladesh has been raised. Low tax revenue, under the current structure, is likely to deter the government from spending on mitigation projects. In that regard, a fiscal reform with a carbon tax could raise revenue to support mitigation projects.

While enhancing mitigation, it is also important to consider national development priority especially in a developing country like Bangladesh. In that context, it appears that carbon tax would also complement other policies, viz. renewable energy and energy efficiency, through revenue redistribution mechanism. As Bangladesh is facing challenges in dealing with deteriorating air quality, carbon revenue could be directed to air quality improvement projects. Another positive attribute of carbon tax is that it would reduce the price distortion, i.e., energy

[17] https://www.adb.org/sites/default/files/project-document/80742/45916-014-tacr-01.pdf

subsidies, in Bangladesh. Additionally, tax ensures price certainty whereas price volatility has been a major issue in different cap and trade systems in the world, reducing their effectiveness.

While respondents consider a mandatory scheme as the most appropriate way forward for Bangladesh considering the consistent economic growth, increasing GHG emissions and anticipated increase in energy consumption in next decades, it is recommended to be cautious while introducing such a scheme and move gradually instead of declaring a nation-wide scheme abruptly. A gradual phase is seen as a platform to not only gather experience but also fine-tune the scheme where it is necessary. It would help build public confidence to move ahead to expand the scheme. In parallel, a gradual phase would reflect the government's intention that pollution would not be tolerated.

At the outset, it is necessary to align energy and climate policies with carbon pricing instrument so as to ensure compatibility. Stakeholders shall be engaged inclusively and informed about the objectives of carbon pricing and how the revenue would be redistributed.

V. Design features & Implementation framework

This section provides detailed design features and implementation framework for the proposed carbon tax scheme of Bangladesh. Building on the expert interviews, review of different carbon pricing schemes and the World Bank case studies on implemented carbon tax schemes of selected countries (PMR, 2017b), an implementation framework, consisting of eight steps, is proposed and detailed below. In addition, stakeholders shall be consistently engaged in several steps, as shown in FIG XV.

V.I Setting policy goals

From the review of different operational carbon pricing schemes, it is imperative to approve necessary law to implement a carbon pricing tool, explicitly stating the goals of such policy. Such objectives could be any or several of the options, for example, to ensure that the polluters also pay for pollution, to reduce GHG emissions, to correct perverse incentives to pollute/remove subsidy, to encourage individual citizen to reduce own energy consumption, to create fund for promotion of alternative energies to make them economically more attractive, implementing air quality improvement projects etc. While the emission projection in power sector under NDC of Bangladesh has considered the anticipated increase in the use of coal and according to PSMP-16, share of coal may rise up to 35% from 1.3% in generating power in 2041 with the objective of harnessing cheap electricity, currently cost per unit of electricity generated from renewable sources is cheaper than coal. As the fossil fuels are likely to become costlier, the government may need to review contribution of coal under PSMP-16. Moreover, per capita GHG emission in Bangladesh, according to third national communication to be submitted to the UNFCCC, was already much higher in 2012 compared to previous assumption/estimate. As such, it is likely that overall emission would exceed the BAU emission projected under NDC of Bangladesh. Taking all these into consideration, a carbon tax has the potential to serve several policy goals in Bangladesh and therefore, could be part of a larger energy, climate and fiscal policy mix. Firstly, it could help the government in removing energy subsidies[18]. Since energy subsidies are more beneficial for the high-income group compared to the low-income group, as discussed before, it is also relevant to eliminate energy subsidies completely. Secondly, a carbon tax would help the government contain the increasing trend of GHG emission and achieving NDC targets as polluters, under the scheme, would be obliged to pay for their fuel consumption and this would encourage the polluters to take measures to

[18] The Government of Bangladesh is in the process of phasing out energy subsides

reduce their fuel consumption. In fact, it would give the polluters the flexibility to either pay tax or reduce fuel consumption. Thirdly, revenue from carbon tax could be used in subsidizing renewable energy and energy efficiency projects. Overall, a carbon tax could promote both renewable energy and energy efficiency in two ways, i.e., without energy subsidy in fossil fuels, renewable energy and energy efficiency would be more attractive compared to BAU situation and revenue from tax could be channeled to incentivize renewable energy and energy efficiency. The fund could also be utilized in supporting climate adaptation projects, within and beyond NDC.

V.II Impacts and needs assessment

Evaluating the broader impacts of a carbon tax, for example, the costs and benefits of a given carbon tax design, changes in GDP and distributional impacts/costs and benefits across income groups and sectors, is necessary. It is also important to predict the environmental benefits of carbon tax apart from GHG mitigation. Moreover, the revenue recycling mechanism to address the impacts shall be designed particularly for the low-income group. On the other hand, mapping the roles and functions for administering a carbon tax would provide the scope to determine whether the required roles could be carried out with the existing institutional capacity or capacity development is needed.

V.III Design

The design features include several steps to consider pertaining to the sources and/or sectors to be brought under carbon tax, how to establish a tax rate and at which point the emissions would be regulated. These points are furnished below.

i. Scopes and Coverage

Once the goals of carbon pricing are set, it is important to fix sources and sectors/sub-sectors to be covered by carbon pricing. If all fossil fuels are not considered initially, emission factors of fuels may be used to determine fuels for inclusion in the scheme. The decision is required as to whether power sector shall be included at the beginning. On the other hand, energy/emission profile of a sector/sub-sector could be the primary factor behind bringing a sub-sector/sector under the carbon pricing scheme. Political feasibility also plays an important role. For example, textile sub-sector, a major contributor to the GDP of Bangladesh, receives special tax rebate to be internationally competitive. Therefore, the sector shall be excluded

from the carbon pricing scheme. Similar exclusion criteria may be applied for the sub-sector that needs future protection.

ii. Point of Regulation

The point of regulation could be either upstream or downstream. The upstream taxes are typically determined by the quantity of fossil fuels sold, avoiding the requirement of a very stringent MRV. The downstream taxes, however, require to monitor direct emissions with the help of a very complex MRV system. For simplicity of the scheme, the point of regulation could be upstream, for example, an individual entity of a sub-sector, covered by the carbon tax, would pay tax per unit of fuel purchased. For the power sector, the tax may be imposed per MWH of electricity, leading to the payment of tax by a sub-sector included in the scheme based on its consumption.

iii. Tax rate & Methodology to establish the tax rate

Modelling exercise would help compare the economic costs and benefits of different tax rates and anticipated GHG mitigation rates with baseline case, i.e. BAU scenario. Stakeholder consultation based on the outcome of modelling exercise shall be conducted to reach an agreement on rate of the carbon tax. The tax, nevertheless, should be low at the beginning and gradually increased like in the case of other countries, such as India, Mexico and Colombia. Tax per ton of CO_2 may be converted to tax per unit of fuels and per unit of electricity based on the emission factors.

V.IV Measures to address cost containment/carbon leakage

As energy price is comparatively cheaper in the country and export-oriented sub-sector (s) benefit from available and affordable manpower, there is no such risk if carbon pricing scheme is being introduced. It is, however, recommended to set a lower tax at the beginning.

V.V Implementation arrangement & approaches

Ministry of Environment, Forest and Climate Change of Bangladesh may publish list sub-sectors of different sectors that fall under carbon tax. In that regard, data on total energy consumption of different sub-sectors/sectors available at Systems Planning under the Ministry of Power, Energy and Mineral Resources may be used. Suppliers and producers shall be responsible for determining the amount of tax in a given period and submit the same to the National Board of Revenue (NBR), Bangladesh, within the specified day. Clear and meaningful

penalties would reduce the case of noncompliance. Tax on electricity, if included under the pricing scheme, collected with electricity bill shall be deposited to the designated account by the Power Development Board (PDB). Overall, clear procedures for coordination of the government entities, as mentioned above, shall be established.

V.VI Monitoring & Verification

Producers and suppliers of fuels, included in the scheme, shall follow the documentation process as prescribed by the NBR, Bangladesh. The Auditors or appointed officers of NBR shall cross-check the documents with the amount of tax collected. Tax on electricity, if applicable, would be automatically submitted by the users and therefore, monitoring requirement is minimal.

V.VII Redistribution of revenue

Carbon tax can generate a considerable amount of revenue, which has profound impacts on the economy in that how revenue is being utilized, public welfare is ensured and the tax system is made efficient. Carbon revenue can be utilized in three broad categories: i. revenue neutrality, ii. government spending & iii. allowing entities to surrender offsets against tax (PMR, 2017c). Simply put, revenue neutrality is possible to attain by transferring revenue to the households or low-income groups with the possibility of being affected due to tax and providing rebates to businesses that may be exposed to trade. Government spending may include the utilization of revenue for specific purposes, such as environmental protection, sustainable energy promotion etc. The government may also allow business entities to surrender offsets from other projects as a substitute of part of the carbon tax.

Possible avenues for redistribution of carbon revenue in Bangladesh context may also comprise of three categories as detailed above. Specific purpose fund from tax revenue could be directed to promote renewable energy and energy efficiency for both industry and households to achieve the target of NDC. Improved cook-stove, also included in NDC as a mitigation measure, may be supported through incentive mechanism especially for the rural poor and vulnerable group. In addition to GHG mitigation, it would contain indoor air pollution. Building on broad consensus, part of the fund could be channeled to implement selected adaptation projects, included in NDC. Among other areas, the fund may be utilized in curbing air pollution in the urban areas. Based on the impact assessment and needs of sub-sectors, the government may transfer revenue to the low-income groups and provide rebates to business entities. Provision for offset may be included and would allow mitigation projects in

the sub-sectors that are not covered under carbon tax. Additionally, carbon revenue could play a role in supporting research and development in low carbon technologies.

V.VIII Evaluation

Carbon tax is often described as “learning by doing” scheme as lessons from carbon taxes of different jurisdictions show that adjustments are required over time to get the design of carbon tax right. Therefore, the scheme should be flexible enough with the provision of undergoing modifications as required and have a clearly defined process for such modifications. In view of that, at the end of the initial phase, a detailed study shall be carried out to determine the effectiveness of the scheme in avoiding GHG emissions, to assess the revenue redistribution and its utilization, identify challenges and amend fundamental elements. Based on the evaluations, the adjustments should be made for the improvement of the follow on phase. However, administrative authorities may be delegated for the minor adjustments during the operational phase

FIG XV: Implementation framework for carbon tax in Bangladesh

VI. Conclusion and Outlook

VI.I Conclusion

The third national communication, recently prepared for the UNFCCC, reveals that per capita GHG emission in 2005 was much more than what was reported in 2012. Likewise, per capita GHG emission in 2012 was higher than anticipated per capita emission. As the country has seen sustained robust GDP growth over the last decade and the energy consumption has increased significantly during this period, the present GHG emission may have already exceeded the present BAU GHG emission estimated under NDC. The expected inclusion of coal, according to PSMP-16 and NDC, in power system in the coming years along with projected economic growth would exacerbate the emission trend. While coal has been considered a cheaper fuel in PSMP-16, evidence is available that renewable energy is already cheaper than coal in the international market. Additionally, renewable energy and energy efficiency, which are two important policies to attain NDC targets, are yet to deliver notable results. Public funding for mitigation projects is also unlikely for the country that has a very low tax to GDP ratio. Based on expert interviews and a detailed review of different carbon pricing instruments of selected countries, the study concludes that a carbon tax scheme could address these problems.

The carbon tax, as a policy instrument, could shape the future emission trajectory by containing overall GHG emission to achieve the target of NDC. It would also accelerate the phase-out of energy subsidy process of the government, which is highly relevant as energy subsidy delivers benefits disproportionately to the rich people. It would free up resources for the government and provide the opportunity to recycle the revenue for development projects. On the other hand, the essence of carbon tax, as discussed in the previous sections, is that it could complement other policies. Therefore, carbon tax shall be flanked with complementary policies, such as, renewable energy and energy efficiency. It is worth emphasizing that carbon revenue could play an important role in catalyzing both renewable energy and energy efficiency against the lagging performance until now and could help in reducing projected reliance on coal in the foreseeable future. This would provide the government a leeway to carefully review the anticipated coal capacity development under PSMP-16.

As energy would be costlier due to removal of subsidy and introduction of carbon tax, the rebound effect of energy is likely to be minimized. Moreover, research and development on clean technology, which is stimulated by carbon pricing as literature reveals, could provide cheaper option for carbon reduction. Additionally, air quality improvement would be one of the

potential co-benefits of carbon pricing, for example, in the notoriously polluting brick kiln sector.

Despite the precise impacts and benefits, implementation of such a tool is a significant policy decision, which warrants strong political will of the government. It is also essential to understand the distributional impacts of carbon tax on the economy and welfare impacts of carbon tax on the poor even if the plan is to start with a low tax base. The clear message from the study is that a carbon tax should be the part of a larger energy, climate and fiscal policy mix of the country and implemented gradually. Since carbon tax is a much simpler pricing instrument compared to a cap and trade scheme in terms of both implementation and monitoring, the set-up for corporate tax system in Bangladesh may be used, provided that necessary institutional capacity development is carried out. Finally, a careful planning of the scheme and revenue redistribution mechanism will be crucial to stimulate mitigation of GHG emission and the adoption of clean energy.

VI.II Future area of study

The extension of this study could be the selection of sub-sectors and sources of emissions to be covered initially and assessment of distributional impacts of the carbon tax on different sectors of the economy. It is further essential to analyze the welfare implications of adopting a new policy instrument and to design appropriate safety nets for the low-income and vulnerable group.

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Annex I: Brief and questionnaire for Interview

Being a signatory to the Paris Agreement, Bangladesh is committed to reducing GHG emissions according to its NDC submitted to UNFCCC. In its NDC, Bangladesh has vowed to reduce GHG emissions altogether 5% (unconditional) and 15% (conditional) respectively in power, transport and industry sectors by 2030 compared to business-as-usual scenario. In parallel, according to the national power systems master plan 2016, demand for electricity is expected to triple by 2041 compared to present installed capacity and the share of coal in electricity generation may increase from 1.3% to around 35%.

The national energy supply, including electricity grid, is heavily reliant on natural gas. In both cases, share of gas is over 50%. However, a decade ago, share of gas in electricity generation was around 88% against liquid fuels' share of 9.5%. Now, share of liquid fuels in electricity mix is around 28%. Of total energy supply, including electricity, around 48% is being consumed by industries, 30% by households and 11% by transport sector. The Bangladesh Power Development Board (BPDB) is entrusted with the responsibility of electricity generation and distribution in mainly urban areas except for Dhaka and west zone of the country. BPDB is also the single buyer of electricity produced by other three main power generation companies, independent power producers and rental power producers.

Tariffs of electricity and all fuels are being fixed by Bangladesh Energy Regulatory Commission (BERC). While tariffs of both electricity and all types of fuels have been adjusted several times during last 6-7 years, they are still subsidized.

Before the adoption of the 2014/15 budget of Bangladesh, there was discussion about the introduction of a green tax to internalize the external cost of GHG emissions, it did not receive the necessary public acceptance or political support. At the same time, the experience with command & control instruments is also mixed, such as technology prescriptions to change the polluting technology in the brick kiln sector of Bangladesh, which have not provided sufficient incentives to the entrepreneurs to shift to capital-intensive but less polluting technologies. As the sector is dominated by SMEs, they have shifted to a cheaper alternative, which in turn violates other environmental standards. The government has not been able to enforce those standards. While Bangladesh has had limited success in implementing 'Clean Development Mechanism (CDM)' projects due to lack of capacity, CDM projects have shown that market based instruments can drive emission reduction.

In light of above, the research intends to seek the role of carbon pricing in GHG mitigation in Bangladesh, what would be the suitable instrument for Bangladesh and what are the stepping stones that could lead up to implementation of the instrument.

Q1: Given this mixed record, what could be the main motivation for introducing carbon pricing instrument in Bangladesh?

i. Drive GHG emission reduction
ii. Bring about other co-benefits, such as improved air quality
iii. Increase investment in low carbon technologies
iv. Avoid investment in high carbon technologies
v. Complement other policies (e.g. Renewable Energy, Energy Efficiency)
vi. Generate revenues
vii. Promote energy sector reform
viii. Provide access to International Market
ix. Reduce price distortion (subsidy reform)
x. Others, please mention: …….

Q2[19]: What would be the rationale for business entities or establishments to accept carbon pricing?

i. Meet environmental target
ii. Reduce GHG emission at lower cost
iii. Develop green business
iv. Increase business reputation

Q3 (a): Which type of instrument would be most suitable for implementation in Bangladesh in your opinion?

i. Voluntary scheme
ii. Mandatory Scheme
iii. Carbon Tax
iv. Internal carbon price
v. Renewable energy obligation trading (Green Certificates)
vi. Energy efficiency trade (White Certificates)
vii. Cap and Trade greenhouse gas trading
viii. Baseline and credit greenhouse gas trading
ix. Others, please mention: ……..

[19] The question is only directed to the Bangladeshi respondents

Q3 (b): What are the reasons behind choosing the option (s) under Q2 (a)

Q4: What would be the most important steps/preconditions for implementation of carbon pricing instrument in Bangladesh?

***Your response**:*

Q5 (a): Do you think starting with a trial period/gradual phase/pilot would be a good idea at the beginning and why?

***Your response**:*

Q5 (b): Based on which criteria could sectors be chosen for inclusion in a trial period/gradual phase/pilot?

***Your response**:*

Q5 (c): What would you hope to gain from the trial period/gradual phase/pilot?

***Your response**:*

i. Gather data
ii. Ensure accuracy of data
iii. Gather experience
iv. Bring private sector on board
v. Develop monitoring and verification system
vi. Develop rules for mandatory phase

Others, namely: …….

Annex II: List of interviewees

Sl. No.	Name	Affiliation at the time of Interview	Date of Interview
1	Mr. Aki Kachi	New Climate Institute, Berlin, Germany	18.07.2018
2	Mr. Eike Meyer	Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH, Berlin, Germany	19.07.2018
3	Ms. Noémie Klein	Ecofys UK Ltd., London, UK	30.07.2018
4	Dr. Ziaur Rahman Khan	Bangladesh University of Engineering & Technology (BUET), Dhaka, Bangladesh	10.08.2018
5	Mr. Virender Kumar Duggal	ADB, Manila, Philippines	10.08.2018
6	Mr. Siddique Zobair	Sustainable and Renewable Energy Development Authority (SREDA), Ministry of Power, Energy and Mineral Resources, Dhaka, Bangladesh	12.08.2018
7	Dr. Balasankari Sivakumar	Renewable Cogen Asia, India	14.08.2018
8	Mr. Hasan Tareq	Bangladesh Rural Advancement Committee (BRAC), Dhaka, Bangladesh	15.08.2018
9	Mr. Raihan Uddin Ahmed	Infrastructure Development Company Limited (IDCOL), Dhaka, Bangladesh	16.08.2018
10	Mr. Nabil Haque	PhD Candidate, Stony Brook University, Stony Brook, New York, USA	18.08.2018
11	Dr. Sabine Fuss	Mercator Research Institute on Global Commons and Climate Change (MCC) gGmbH, Berlin, Germany	24.08.2018
12	Mr. S. M. Zahid Hasan	Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH, Dhaka, Bangladesh	28.08.2018
13	Mr. Wolfgang Obergassel	Wuppertal Institute for Climate, Environment and Energy, Wuppertal, Germany	30.08.2018
14	Mr. Shaymal Barman	Energy and Climate Change Expert, Dhaka, Bangladesh	03.09.2018

15	Dr. A K M Nazrul Islam	Dhaka School of Economics, University of Dhaka, Bangladesh	07.09.2018
16	Mr. Hemant Nanadanpawar	Ernst & Young (EY), Manila, Philippines	07.09.2018
17	Mr. Suvojit Chattopadhyay	Adam Smith International, Dhaka, Bangladesh	05.11.2018
18	Mr. Matthias Duwe	Ecologic Institute, Berlin, Germany	20.11.2018
19	Mr. Utpal Bhattacharjee	Energy and Climate Change Expert, Dhaka, Bangladesh	03.12.2018
20	Mr. Alexander Eden	Adelphi, Berlin, Germany	14.01.2019